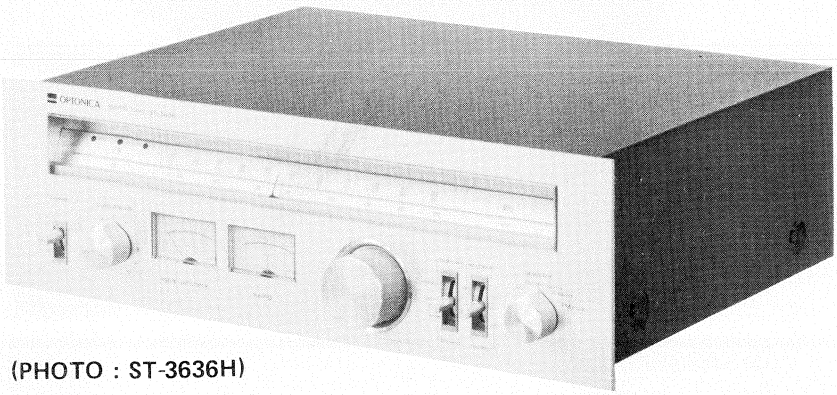
SHARP OPTONICA

SERVICE MANUAL

ST-3636HB
ST-3636H

FM/AM (MW)
Stereo tuner



(PHOTO : ST-3636H)

MODEL
ST-3636H
(Silver Panel)
ST-3636HB
(Black Panel)

In the interests of user-safety the set should be restored to its original condition and only parts identical to those specified be used.

SPECIFICATIONS

GENERAL DESCRIPTION

Power source:	AC 110/220/240V, 50/60Hz
Power consumption:	24W
Circuit:	Superheterodyne system, FM/AM 2-band tuner, with PLL stereo demodulator, FM muting, FM multipath detection, variable air check calibrator, FM auto lock, FM IF band selector circuit.
Semiconductors:	4-IC (integrated circuit) 3-FET (dual gate, MOS type) 28-transistor 36-diode (1-zener diode) 3-LED
Dimensions:	Width: 442mm Height: 144mm Depth: 373mm
Weight:	7.5kg

FM

Tuning range:	87.6 ~ 108MHz
IF:	10.7MHz
Sensitivity : at S/N 26dB, 40kHz deviation:	1.4μV
Frequency response:	30 ~ 15,000Hz $^{+1.5}_{-3}$ dB
Image rejection:	110dB (at 98MHz)
I.F. rejection:	100dB (at 98MHz)
Selectivity:	72dB (normal) 30dB (wide)
Capture ratio:	2.5dB (normal) 1.5dB (wide)
AM suppression:	45dB
S/N:	65dB (40kHz deviation)
Distortion:	mono: 0.6% (normal) 0.25% (wide) stereo: 0.8% (normal) 0.4% (wide)
Stereo separation:	42dB (1kHz)

AM (MW)

Tuning range:	520 ~ 1620kHz
IF:	455kHz
Quieting sensitivity:	400μV/m
Image rejection:	55dB (at 1400kHz)
I.F. rejection:	50dB (at 600kHz)
Distortion:	1.5%

AUDIO

FM output voltage:	
Variable:	0 ~ 0.55V
Fixed:	0.35V
AM output voltage:	
Variable:	0 ~ 0.35V
Fixed:	0.2V

SHARP CORPORATION OSAKA, JAPAN

VOLTAGE SELECTION

Check the preset voltage before connecting the mains plug to a mains outlet. If the setting is different from your local supply mains voltage, the selector must be re-set as follows. Rotate the voltage selector by using a screw driver so that your local voltage number can be seen.

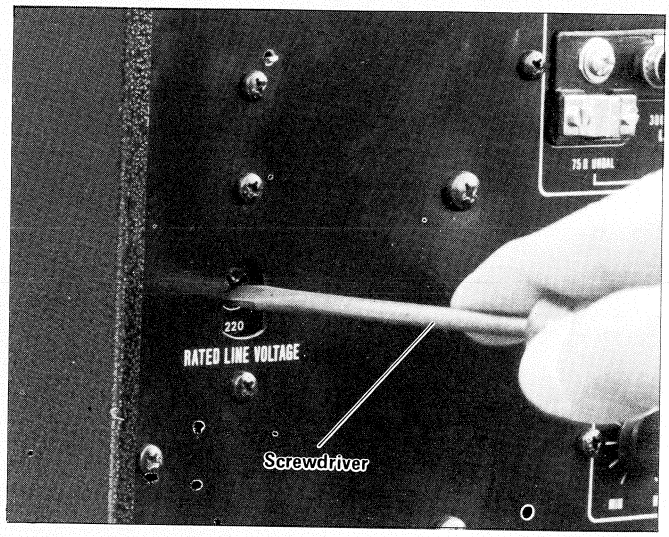


Figure 1

DISASSEMBLY

Prior to removing the chassis, be sure to draw the power supply plug from a wall outlet. Then, proceed with the removal work in the following order after disconnecting all of the connection cords at the rear of the set.

1) To remove the cabinet:
   Remove 12 screws ① retaining the cabinet (6 screws each for the right and left sides), then the cabinet can be detached.
2) To remove the bottom board:
   Turn over the set and remove 8 screws ② retaining the bottom board, then the bottom board can be detached.
3) To remove the front panel:
   (1) Use a hexagonal wrench (1.4mm) to loosen the screw retaining the tuning knob ③ at the front panel, and pull out the tuning knob.
   (2) Pull out the remaining knobs ④ (5 knobs).
   (3) Finally remove 4 screws ⑤ retaining the front panel, then the front panel can be detached.

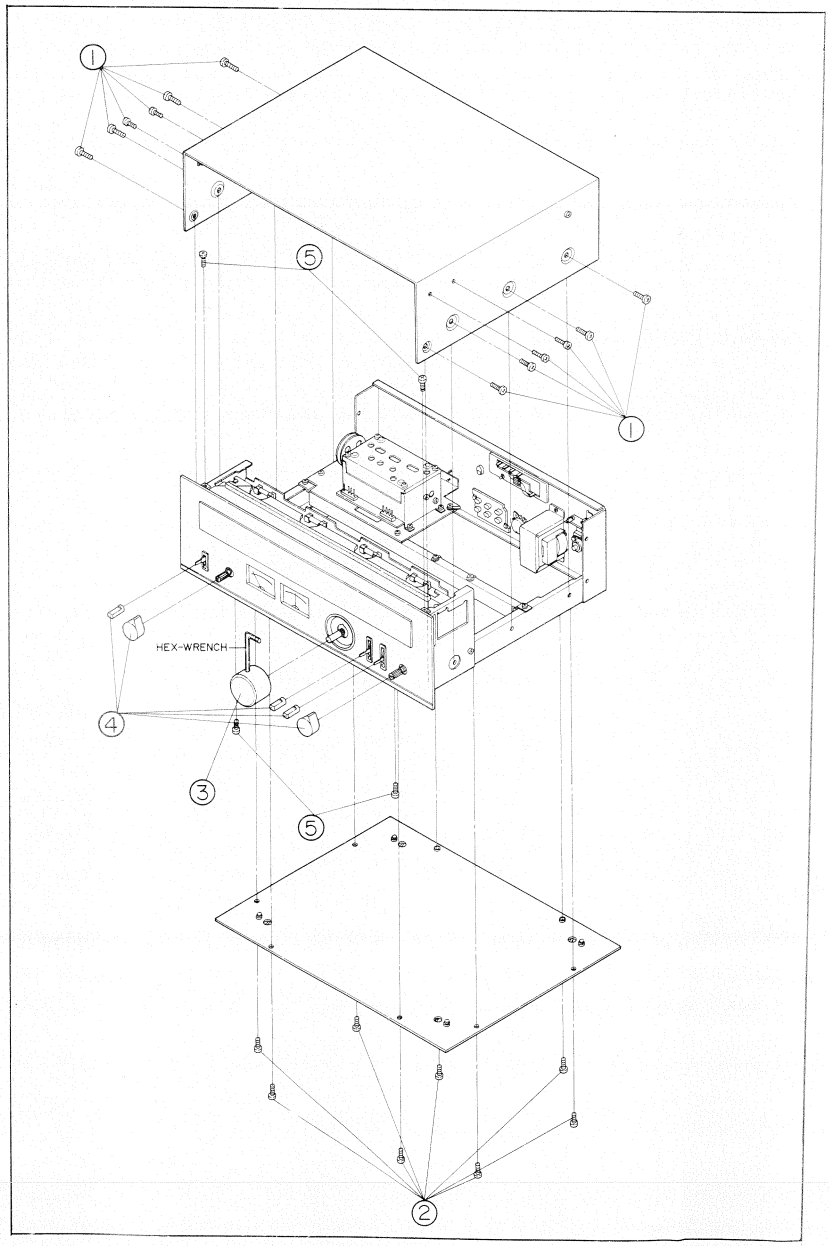


Figure 2 DISASSEMBLY

DIAL CORD STRINGING

1) SETTING OF THE DRUM

1. Turn the variable capacitor shaft fully clockwise (at the lowest frequency position).
2. Insert the drum into the variable capacitor shaft in a such a way as to provide no inserting angle deviation. (See Fig. 3-1.)
3. Tighten them by using two screws.

2) SETTING OF THE DIAL CORD

1. Turn the drum fully clockwise (at the lowest frequency position).
2. Put a hook of the spring on the central hole of the drum.
3. Then proceed with stringing in the numerical order from ① to ⑨ . At this work, while holding a hand at the position ⑦ to temporarily fix a dial string, wind the string on the drum by 1-1/2 turns at the position ⑧ (which is an extention of the string wound at the position ⑦) and bring it through the position ⑨ . Then release a hand from the position ⑦ and thus the stringing is completed.

3) SETTING OF THE POINTER

1. Turn the tuning shaft fully clockwise (at the highest frequency position).
2. Align the pointer to the extreme right of the dial scale plate. (See Fig. 3-2.)

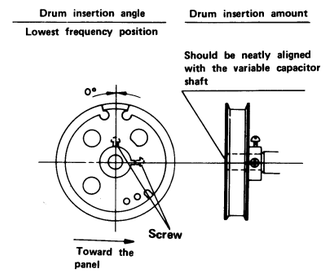


Figure 3-1

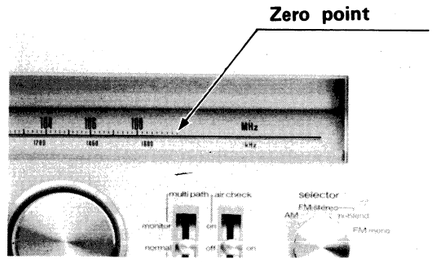


Figure 3-2

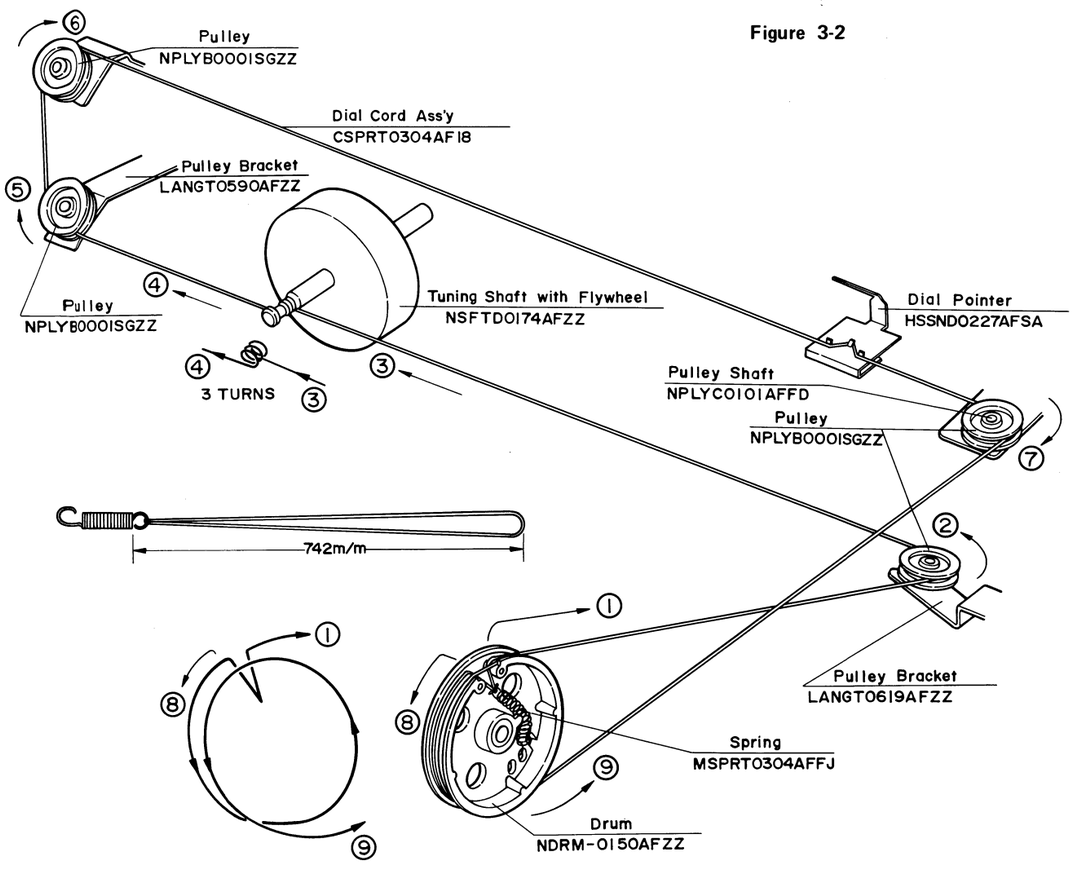
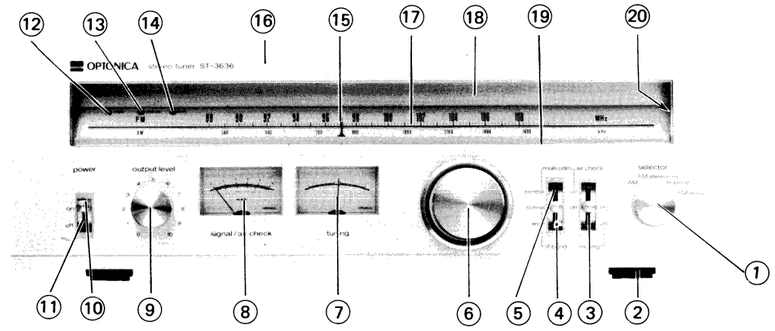


Figure 3 DIAL CORD STRINGING

LAYOUT OF FRONT PARTS

(PHOTO : ST-3636H)

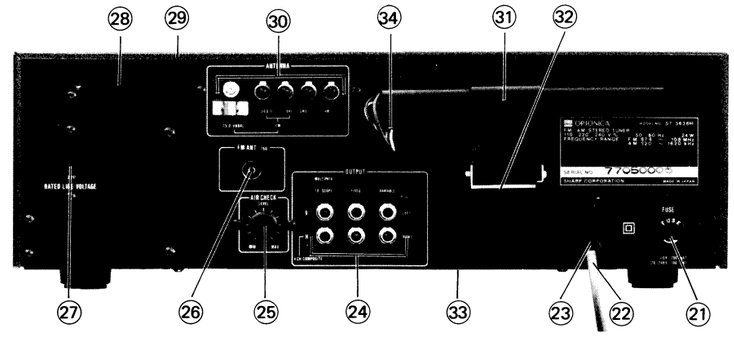


① Band selector/High blend knob (ST-3636H JKNBN0330AFSA, ST-3636HB JKNBN0330AFSB)
② Leg (GLEGP0002SG00)
③ Air check/FM muting switch knob (ST-3636H JKNBP0070AFSA, ST-3636HB JKNBP0070AFSC)
④ Multipath/IF band switch knob (ST-3636H JKNBP0070AFSA, ST-3636HB JKNBP0070AFSC)
⑤ Guide (Large), Lever switch (ST-3636H GCOVA1070AFSC, ST-3636HB GCOVA1097AFSA)
⑥ Tuning control knob (ST-3636H JKNBB0060AFSA, ST-3636HB JKNBB0060AFSB)
⑦ FM tuning meter, ME901 (RMTRL0129AFSA)
⑧ Signal strength/Air check meter, ME902 (RMTRL0137AFSA)
⑨ Output level control knob (ST-3636H JKNBN0330AFSA, ST-3636HB JKNBN0330AFSB)
⑩ Power switch knob (ST-3636H JKNBP0070AFSA, ST-3636HB JKNBP0070AFSC)
⑪ Guide (Small), Lever switch (ST-3636H GCOVA1071AFSC, ST-3636HB GCOVA1098AFSA)
⑫ Wide indicator (Green), LED901 (VHPGL32PG//-1)
⑬ FM stereo indicator (Red), LED902 (VHPGL32AR//-1)
⑭ Auto lock indicator (Red), LED903 (VHPGL32AR//-1)
⑮ Dial pointer (HSSND0227AFSA)
⑯ Panel (ST-3636H HPNLC3282AFSA, ST-3636HB HPNLC3282AFSB)
⑰ Dial scale (HDALM0178AFSA)
⑱ Window, Transparent (HDECZ0052AFSA)
⑲ Decoration plate, dial scale, under (HDECB0063AFSA)
⑳ Decoration plate, dial scale, side (HDECB0062AFSA)

Figure 4 FRONT PARTS LAYOUT

LAYOUT OF REAR PARTS

(PHOTO : ST-3636H)



㉑ Fuse holder (QFSHP1001AGZZ)
㉒ Power supply cord
㉓ Bushing, Power supply cord
㉔ Output socket, SO903-A ~ F (QSOCJ2650AFZZ)
㉕ Air check level control knob (JKNBN0227AFSA)
㉖ Socket, U.K. standard co-axial antenna (QSOCZ2177AFZZ)
㉗ Socket, Voltage selector (QSOCE0410AGZZ)
㉘ Rear panel (ST-3636H LANGQ0516AFSA, ST-3636HB LANGQ0541AFSA)
㉙ Cabinet (GCAB-3040AFSA)
㉚ Antenna terminals, TB901 (QTANN0453AFZZ)
㉛ AM bar antenna (RCILA0413AFZZ)
㉜ Bracket, AM bar antenna (LANGQ0423AFZZ)
㉝ Plate, Bottom (GFTAU3056AFZZ)
㉞ Bushing, AM bar antenna lead wire (LBSHC0053AFZZ)

Figure 5 REAR PARTS LAYOUT

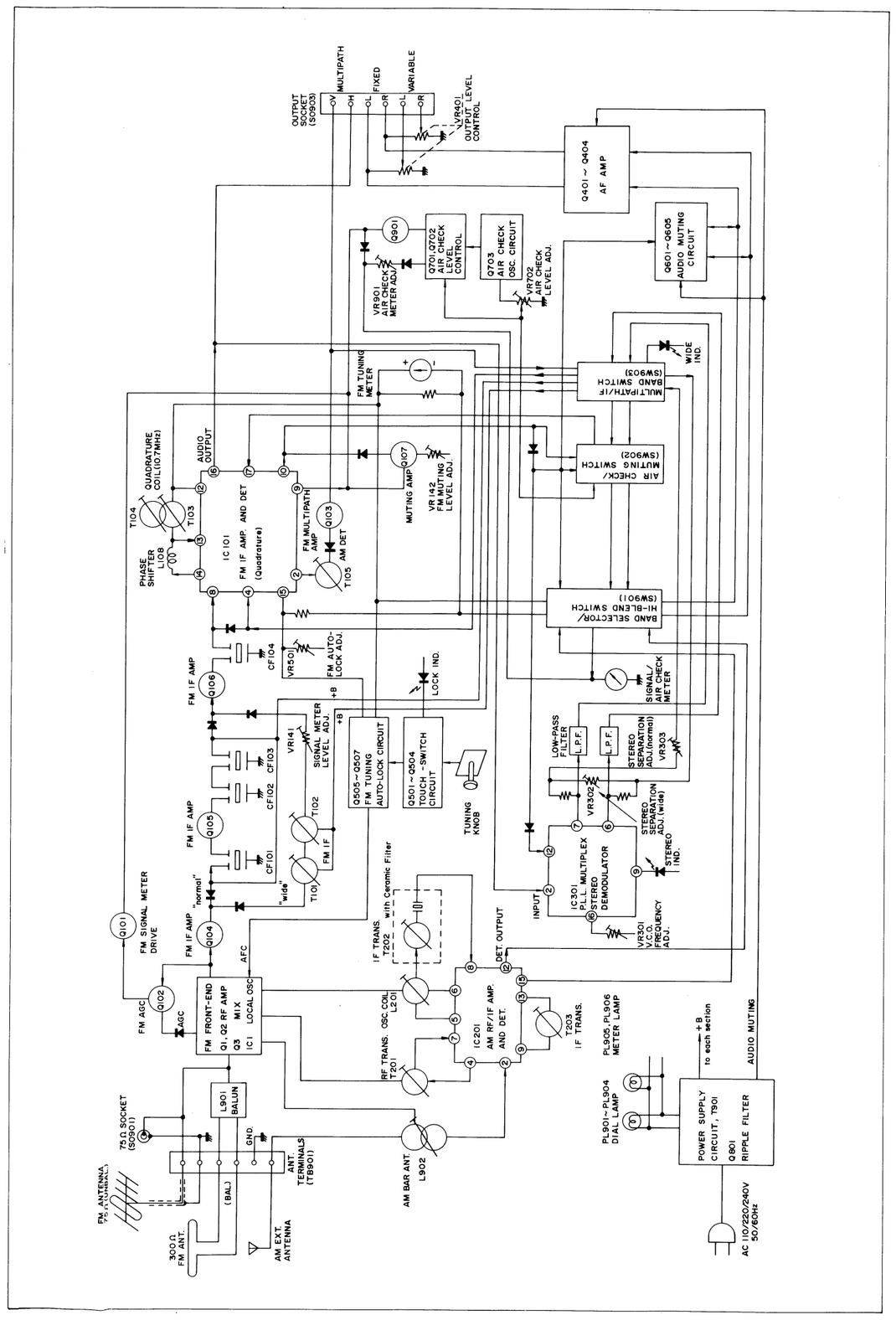


Figure 6 BLOCK DIAGRAM

CIRCUIT DESCRIPTION

AM SECTION

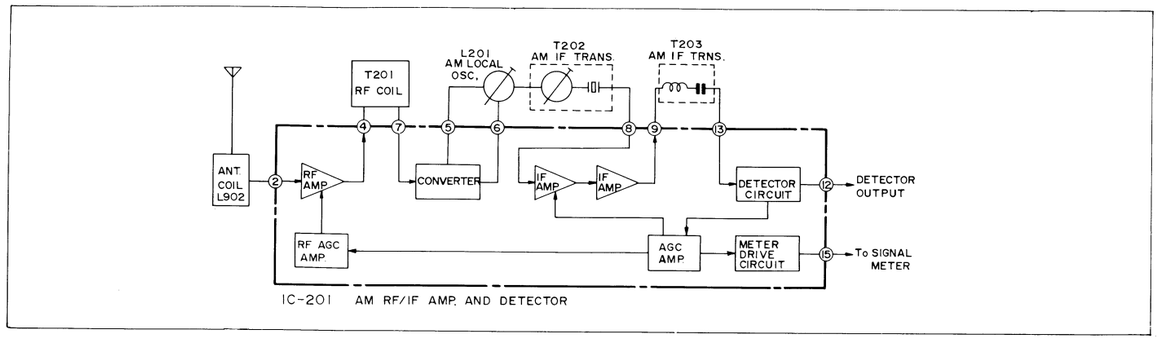


Figure 7 BLOCK DIAGRAM OF IC 201

Fig. 7 is a block diagram of IC201. The coil L902 is AM ferrite bar antenna and it serves as antenna tuning circuit. Being received by the coil L902, AM broadcast signal is applied to the terminal ② of the integrated circuit IC201 to be amplified by RF amplifier and then be supplied to the converter via the RF coil T201. L201 is an oscillation coil for AM local oscillation circuit. AM broadcast signal is thus converted to 455kHz IF signal by the converter to be applied to the transformer T202 which works as intermediate frequency selection element including ceramic filter and the signal will further be amplified by 1st and 2nd IF amplifiers to be applied to the transformer T203. Then the signal is finally detected by the detector circuit and it will be output at the terminal ⑫.
This IC201 also includes signal meter drive circuit which enables easier tuning and the output at the terminal ⑮ is connected to the signal meter (ME902).

FM RF SECTION

FM antenna input circuit has two input terminals (75ohms and 300ohms) thanks to impedance converter (balun), that is, coil L901. The 75ohms input terminal is used when FM antenna is connected to the unit by using a coaxial cable. The 300ohms input terminal is used when FM antenna is connected to the unit by using a balanced feeder. The unit is further provided with a 75ohms socket (U.K. standard co-axial antenna socket) exclusive for FM reception.
Fig. 8 shows FM Front-End circuit. The front-end section consists of 3 dual-gate MOS-FET's and 1 integrated circuit. Transistors Q1, Q2 and Q3 are dual-gate MOS-FET and their function is nearly the same as of vacuum tube. Due to the adoption of MOS-FET's, crossmodulation characteristic and spurious characteristic of the unit are remarkably improved compared with conventional transistor type (Sharp-made ones). It is so devised that AGC voltage is applied to the gate 2 (G_2) of the MOS-FET Q1--this results in that when input signal to FM antenna is strong, amplification degree of the MOS-FET Q1 is so lowered as to stabilize FM reception.

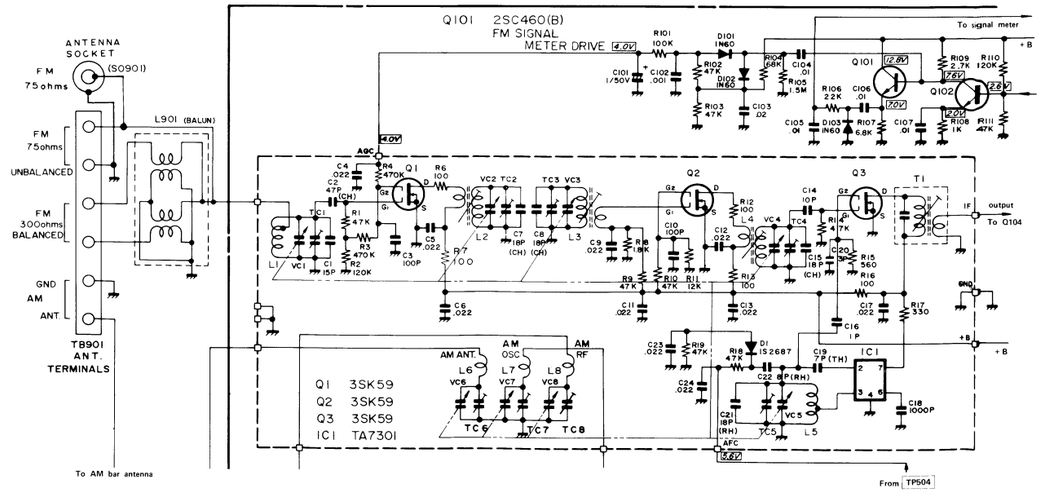


Figure 8 FM FRONT-END CIRCUIT

Voltage to be applied to AGC terminal is about 4V when there is no input signal but this potential is gradually decreased as input signal to the antenna becomes stronger. The voltage will finally be of less than 1V when input signal to the antenna becomes 100dB, thereby making amplification degree of the MOS-FET Q1 be attenuated by about more than 30dB. Dual-gate MOS-FET Q1 and Q2 are for FM RF amplification. Transistor Q3 works as frequency mixer, in which high frequency signal coming from the gate 1 (G_1) and local frequency signal coming from the gate 2 (G_2) are mixed together to produce 10.7MHz intermediate frequency (IF) which will enter IF tuning transformer T1. The integrated circuit IC1 is for the local oscillation and it applies oscillation voltage to the gate 2 (G_2) of MOS-FET Q3 through the capacitor C16.

Coil L1 is for FM antenna tuning, coils L2, L3 and L4 are for FM RF amplification and tuning, and coil L5 is for local oscillation. Diode D1 serves as AFC. Meanwhile, in AM reception, the voltage at the gate 2 (G_2) of MOS-FET Q1 is made to be 0V so that the amplification of Q1 be attenuated. [Never have input signal to the antenna be connected to both the 75ohms terminal (at the screw terminals plate) and the 75ohms socket exclusive for FM reception at a time.]

FM IF AMP. SECTION

Transistors Q104, Q105 and Q106 are the ones for FM IF amplification. This section is to amplify IF signal (10.7MHz) which has been created by the FM front-end section. This 10.7MHz IF signal is given a higher selectivity since it runs through the concentrated selective elements, that is, phase linear ceramic filters CF101, CF102, CF103 and CF104. These filters function to amplify IF (intermediate frequency) signals giving no distortion and to assure a necessary selectivity. The IF signal is further supplied to the terminal ⑧ of the integrated circuit IC101, in which the gain of this signal is increased by about 66dB by the three-stage differential amplifier thus being subjected to an appropriate limiter function.

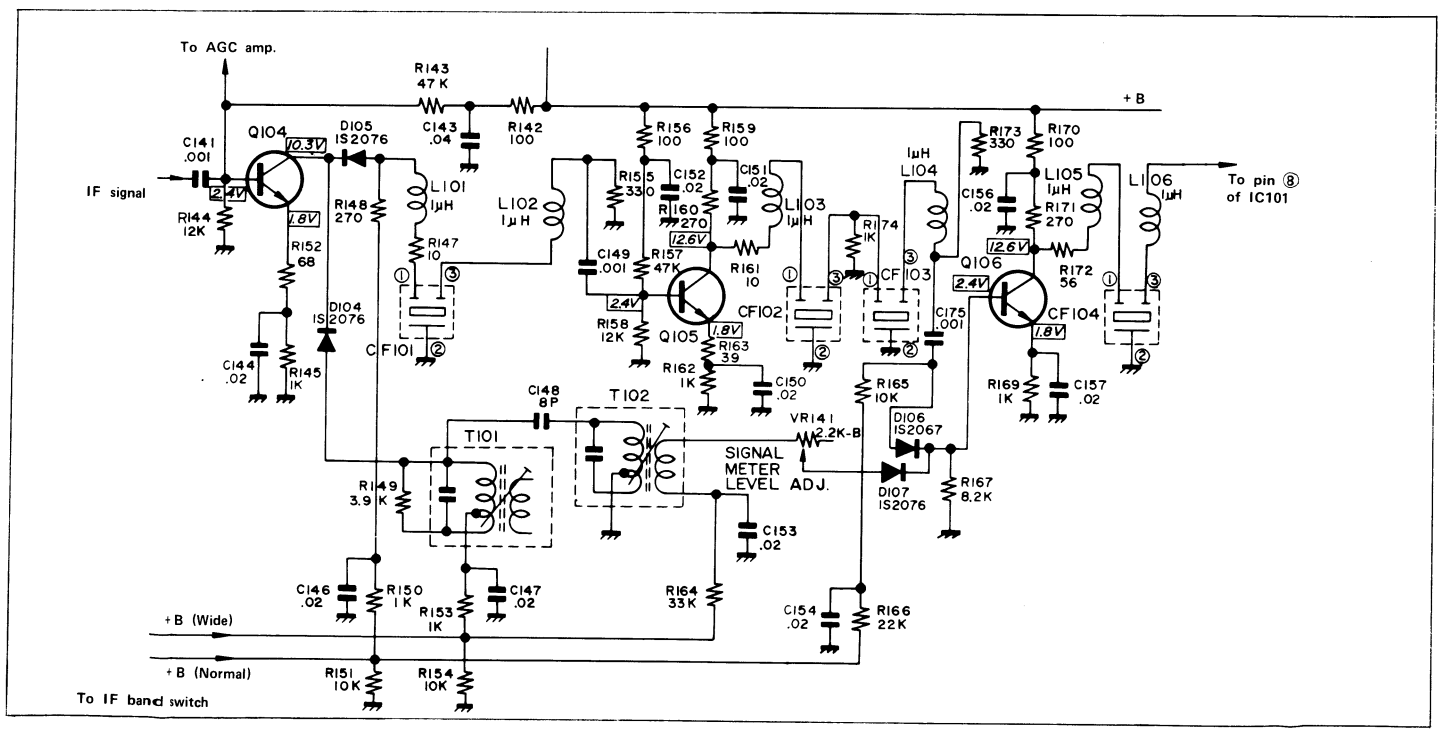


Figure 9 FM IF AMP. CIRCUIT

FM IF BAND WIDTH SELECTOR CIRCUIT

The function of this selector circuit is available in two positions 'normal' and 'wide' for a better selection of FM IF band width. The 'normal' position is suitable for receiving distant station's signals or weak signals while the 'wide' position is used when the reception is in a comparatively good condition with the broadcasting station being not so far.

(1) 'Normal' position

This circuit consists of 4 ceramic filters CF101, CF102, CF103 and CF104 and selection of the IF band width is based on the on-off operation of diodes D104, D105, D106 and D107. With this circuit set to 'normal' position, the diodes D105 and D106 are turned on while those D104 and D107 be turned off so that IF signal runs through Q104, CF101, Q105, CF102, CF103, Q106 and CF104 in this order.

(2) 'Wide' position

With this circuit set to 'wide' position, the double tuned coil (transformers T101 and T102) and ceramic filter CF104 gets in action as selective element. At the time, the diodes D104 and D107 are turned on while those D105 and D106 are turned off since they receive no forward voltage, resulting in that IF signal travels through Q104, T101, T102, Q106 and CF104 in this order. The variable resistor VR141 is to adjust the swing of signal meter to the same level for both 'normal' and 'wide' modes of the selection of IF band width.

FM TUNING AUTO-LOCK MECHANISM

This FM tuning auto-lock mechanism is the touch senser system one by which a desired FM broadcast, if tuned by the tuning knob, will be automatically locked as it were after the tuning knob is released: the tuning is thus hardly affected by external conditions so that the listener can enjoy a distortion-free reception for a longer time without any readjustment of the tuning. Light emitting diode LED 903 (red) of the lock indicator lights up when the lock circuit functions to have the tuning be locked to the desired FM broadcast.

-1- CAPTURE RANGE

In receiving an FM broadcast, if the tuning is completed even in the vicinity of ± 100kHz of such broadcast, an optimum tuning point is automatically selected to be locked.

-2- DETUNING CHARACTERISTIC

After the lock indicator (LED903) is lit (that is, a desired broadcast is tuned and locked by using the tuning knob), if the tuning knob is again touched by hand to make detuning, the lock circuit is unlocked: the lock range is about ± 400kHz.

-3- BEHAVIOR OF AUTO-LOCK CIRCUIT (See Fig. 10)

1) Touch Tuning Circuit

When the tuning knob is being touched by hand, human body-generated hum is applied to point ⓐ to be amplified by the transistors Q501 and Q502. The signal thus amplified is rectified by the diodes D501 and D502 to produce positive (+) voltage at the point ⓑ so that the transistor Q503 is turned on while the transistor Q504 be therefore turned off. Next, base voltage of transistor Q505 rises up and so the transistor Q505 is turned on, resulting in that a reference voltage ⓒ appears as it was at the test point [TP504] to release the lock circuit. Upon the completion of tuning, when the hand is released off the tuning knob, the hum signal stops to enter the point ⓐ and therefore no positive voltage appears at the point ⓑ so that the transistor Q503 be turned off while that Q504 be turned on. As a result, since the base potential of transistor Q505 becomes 0V, the transistor Q505 is cut off and detuning detection voltage is, from the terminal (15) of the integrated circuit IC, applied to the point ⓓ. This results in that frequency control voltage which has been DC amplified by the transistors Q507 and Q506 appears at the test point [TP504] to be supplied to [AFC] terminal of the FM front-end circuit and thus such control frequency is applied to the diode D1 of the front-end circuit: in this way, the local oscillation frequency is controlled to be locked to an optimum tuning point. Simultaneously with this locking, the lock indicator (LED903) lights up.

2) Drive Circuit for the Auto-Lock Circuit and Indicator Circuit

The transistor Q504 works to drive the indicator circuit and auto-lock ON-OFF circuit. When a hand is released off the tuning knob, the transistor Q503 is turned off while that Q504 is turned on so that the lock indicator (LED903) lights up.

3) Lock ON-OFF Circuit

The transistor Q505 is the one that can turn on or off the lock circuit: instantly when the transistor Q504 is turned on and the lock indicator lights up, the transistor Q505 is turned off.

With the transistor Q505 turned off, lock signal arising at the terminal (15) of IC101 is supplied to the point ⓓ to be amplified by DC amplifier (transistors Q506 and Q507), so that it will appear at the test point [TP504] through the resistor R510.

On the other hand, with the transistor Q505 turned on, a reference voltage at the point ⓒ appears as it is at the test point [TP504] so that the lock circuit won't tend to operate. In the status where the lock circuit is not operating, a reference voltage is being applied to [AFC] terminal of the front-end circuit through the transistor Q505--this is totally the same as in an ordinary type tuner.

4) DC Amplifier for Lock Signal Amplification

This DC amplifier is composed of transistors Q506 and Q507 and it is to amplify the signal at the point ⓓ while reversing the polarity from one to another. Capture range of the locking is decided by how much amplification degree this circuit has. Diodes D505 and D506 are to carry out temperature compensation for this DC amplifier. Variable resistor VR501 is, if used, to adjust the center of the lock signal which has been supplied from the point ⓓ so that it will be aligned with the reference voltage (the voltage at the test point [TP504]) which has been supplied from the point ⓒ, when the lock circuit is turned on.

5) Capture Range

Zero-volt switch is provided at IC101 and it has such a characteristic as shown in Fig. 12: only when a desired signal is tuned to the vicinity of ±△f from the exact tuning point, the switch is turned on (as indicated by the oblique lines in Fig. 12) and detuning detection signal appears at the terminal (15).

Therefore, capture characteristic appearing at the point ⓓ becomes effective in the shaded zones in Figs. 13 and 14. (indicated by the oblique lines in Fig. 11)

6) Lock Range

If the tuning is once set up (captured), it can withstand the frequency drift caused due to the fluctuation of external conditions: the resistive range is practically about ± 200kHz (nearly equal to IF band width) although it differs a little according to the IF band position 'wide' or 'normal'. A difference between Figs. 13 and 14 is resulted from that the lock gain is increased by the transistors Q506 and Q507 so as to make polarity conversion of the frequency control voltage and to have the tuning be locked to a more accurate tuning central frequency.

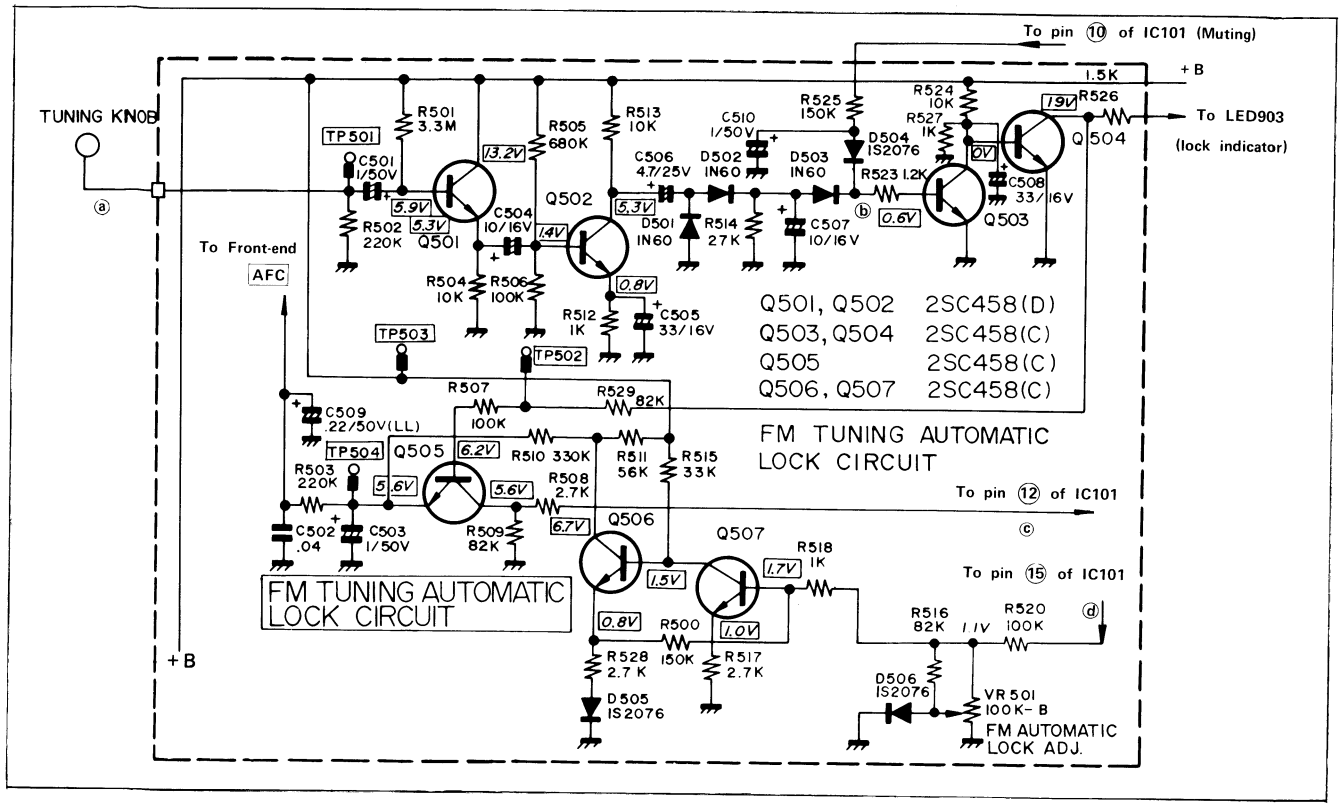


Figure 10 FM TUNING AUTO-LOCK CIRCUIT

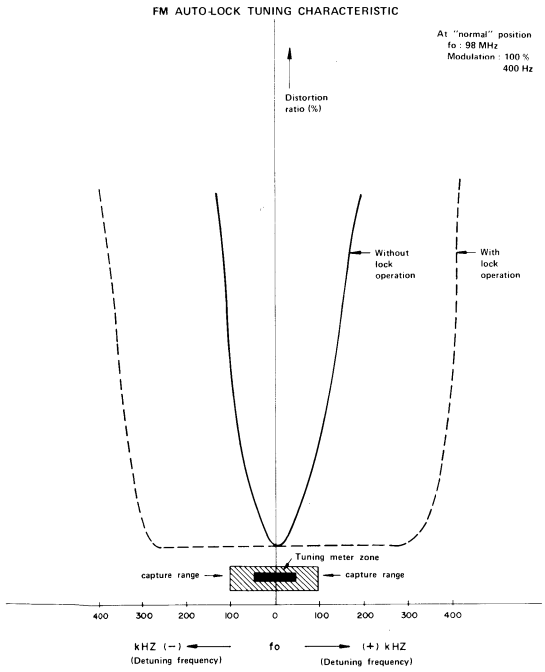


Figure 11 AUTO-LOCK TUNING CHARACTERISTIC

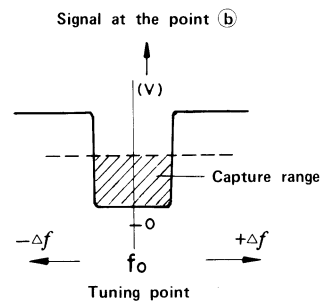


Figure 12

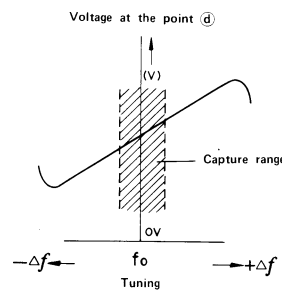


Figure 13

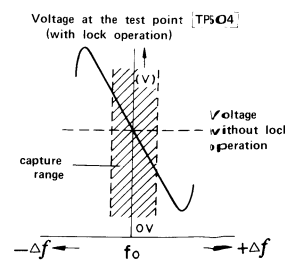


Figure 14

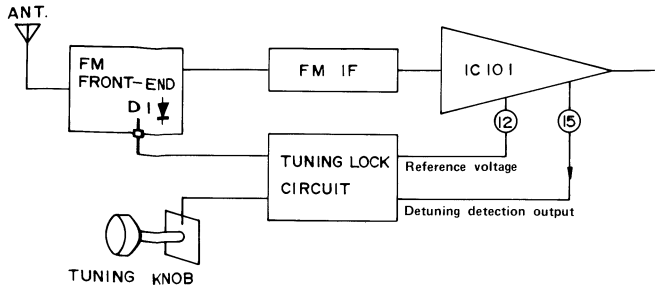
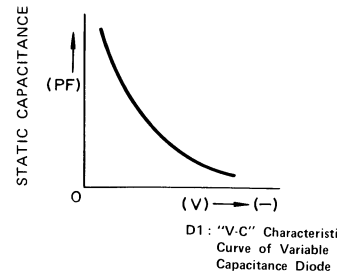


Figure 15 AUTO-LOCK LOOP



D1 : "V-C" Characteristic Curve of Variable Capacitance Diode

Figure 16

FM DETECTION SECTIONS (Quadrature Detector Circuit)

FM Detector Circuit
This unit employs 'Quadrature Detector' based on newly developed IC (Integrated Circuit), which is substituted for ratio detector and Foster-Seeley's detector that have been so far used. The basic structure of quadrature detector circuit is as shown in Fig. 17.

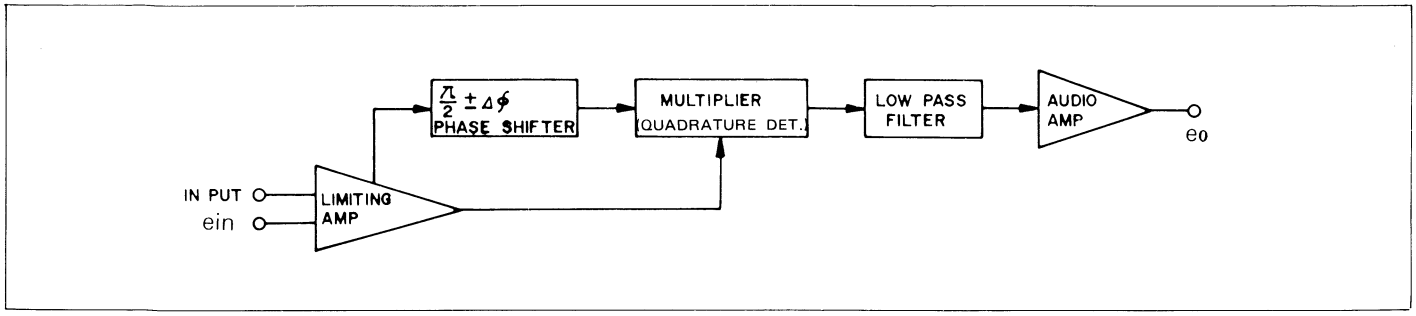
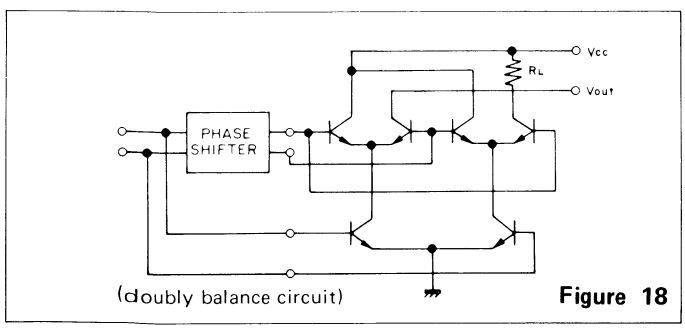


Figure 17 BASIC STRUCTURE OF QUADRATURE DETECTOR CIRCUIT

With this detection system, the multiplier (quadrature detector) circuit receives two types of input signals, one is the signal which has been amplified by the limiting amplifier and another which has passed through the phase shift circuit (about $\pi/2$). Thus, the quadrature detector circuit produces demodulation signal.
The term 'quadrature' is resulted from that the phase difference between these two signal is $\pi/2$. The multiplier consists of doubly balance circuit as shown in the following circuit drawing. Phase characteristic of the phase shift circuit is as shown in Fig. 19.
This circuit is featured by:

(1) Good linearity and low distortion.
(2) Operates on small signal and less higher harmonics.
(3) Wide-band detection of as much as 1.2MHz.

Therefore, this circuit assures low distortion even with the overmodulation of more than 100% thereby reproducing high quality sound.
Actually saying, the detecting circuit ST-3636H/ST-3636HB uses L108 as phase-shift coil. T103 and T104 are 10.7MHz tuning quadrature coil.
Detection output appears at the terminal (16) of IC101 and it is supplied to the terminal (2) of P.L.L. multiplex integrated circuit IC201.



(doubly balance circuit) **Figure 18**

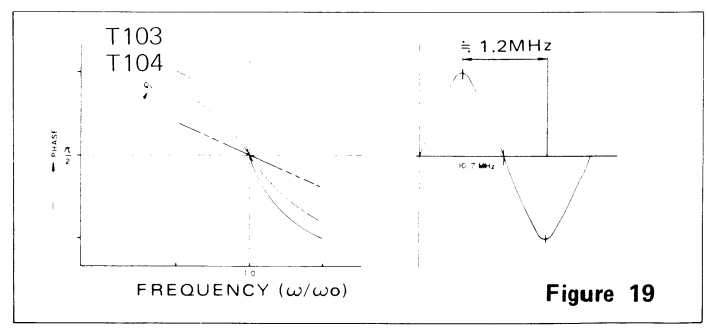


Figure 19

FM MUTING CIRCUIT

In the ST-3636H/ST-3636HB, IC101 incorporates muting circuit and this circuit is so designed that FM input signal to the FM antenna terminal becomes 20dB when the muting/air check switch (SW902) is kept at 'Muting on', the muting in turn is cancelled and the signal will appear at the output without undergoing muting. The muting release signal is produced by addition of two signals, one is the output signal at the terminal (10) of IC101 which specifies the muting width to about 150kHz and another is signal meter drive signal at the terminal (9) of IC101 which will undergo polarity inversion by the transistor Q107 so that it be cancelled when the antenna input signal becomes about 20dB through the semi-fixed resistor VR142. These two signals are applied to the audio mute circuit (terminal (17) of IC101) and the base of transistor Q602 via the muting/air check switch (SW902), thus the muting operation being assured. The signal to release (or cancel) this muting is applied to the terminal (12) of P.L.L. stereo multiplex demodulator IC301 to make stereo signal be forced to monaural signal.

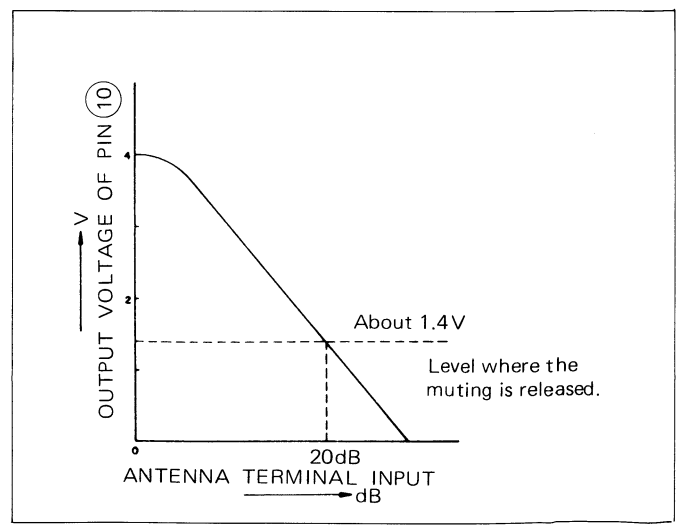


Figure 20

FM AGC

In non-signal operation, a potential of about 4V is being applied to the FM AGC terminal thanks to resistors R101, R102, R103 and R104.
During FM reception, IF signal coming from the FM front-end circuit is taken out by the capacitor C142, amplified by the transistor Q102 and negatively rectified by the diodes D101 and D102. However, when FM signal to the antenna terminal becomes about 70dB, the voltage at the AGC terminal begins to go down so that the gate voltage of transistor Q1 be decreased, resulting in that the AGC is able to function.

MULTIPATH DETECTOR CIRCUIT

-1- WHAT'S MULTIPATH ?

1) Multipath Distortion

In any of electric-wave signals broadcasting including FM waves, it would be ideal if the signals emitted by a broadcasting station were caught by a receiver's antenna as they were without being obstructed by any objects in the midway. Actually saying, however, there are practically some obtacles (like mountains and skyscrapers, etc.) between the transmitter side and the receiver side, which have the emitted signals undergo a phenomenon of waves' reflection, leading to that the signals become distorted variously when caught by the receiver's antenna. A simple example concerning this distortion is that in the mountainous area or large cities full of higher buildings, the TV sets get produced images be doubled (this is called a ghost). This phenomenon is a sort of multipath distortion and it is caused by that there is a time delay between the direct waves and reflected waves. In the case of radio sets, this is referred to as that the reproduced sounds contain distortions: particularly as for stereo broadcasting signals, since their band width is rather wider and so they are apt to be interferred by various objects, not only the distorted sounds are produced but also the stereo separation characteristic will suffer. These phenomena are named a multipath distortion.

2) Multipath Distortion Detection

Multipath distortions are classified into the two, that is, phase distortion which is found out by the frequency discriminator and AM distortion which is removed by the limiter circuit: the latter AM distortion is actually subjected to detection by the multipath detector circuit.

-2- MULTIPATH CIRCUIT

When the multipath/IF band switch is set to 'monitor' position, since the diode D112 is biased so that it will be turned on, IF signal enters the terminal ④ of IC101 via R120, C119, D112 and C109.
The terminals ④ and ② of IC101 are respectively the input and output of an independent amplifier incorporated in this IC. IF signal coming out of the terminal ② is AM-detected by the transformer T105 and diode D114. Multipath component, if included in FM reception, is considered AM output and this signal is amplified by the transistor Q103 to be applied to the multipath terminal V (Vertical) at the rear of the panel (which is the connection terminal for the monitor and synchroscope outputs).

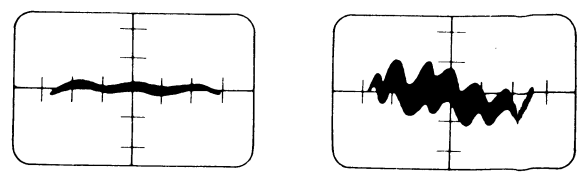
-3- ACTUAL METHOD ON MULTIPATH DISTORTION DETECTION

1) Detection by using an oscilloscope

In this case, output of the multipath circuit said in the step -2- above is connected to the V (Vertical) terminal of oscilloscope while the quadrature detection output to its H (Horizontal) terminal. The oscilloscope is thus able to draw waveforms on its screen according to the output size of distorted components. This requires such procedures that the multipath 'V' and 'H' terminals located at the rear panel of the unit be connected respectively to the vertical axis and horizontal axis terminals of the oscilloscope. Under this condition, receive FM broadcast and adjust the tuning so that the signal meter swings to the right most while the tuning meter's pointer indicates the center. After that, make the sensitivity of the oscilloscope be about 5mV/cm for both the vertical and horizontal axes. The oscilloscope will then produce waveforms on it according to the extent of multipath distortion as shown in Fig. 21.

2) Detection by using a monitor

With the multipath/IF band switch being set to 'monitor', make distorted sound be audible from the speaker and check for the multipath distortion by human ears: actually for this operation, receive FM broadcast and adjust the tuning so as to have the signal meter swing to the right at maximum; then manipulate the control of the pre/main amplifier connected with the tuner so that multipath distorted sound becomes audible.
Keeping the above condition, rotate the antenna to a position where the distorted sound in FM reception will be as minimized as possible: at the time, see that the signal meter can swing in the range not so narrower while the tuning meter indicates the center.



In the case of less multipath distortion

In the case of much multipath distortion

Figure 21

FM STEREO DEMODULATOR SECTION

1) Features of P.L.L. stereo demodulator circuit

This set incorporates a stereo demodulator circuit that comprises IC's with the P.L.L. (Phase Locked Loop) system applied. The P.L.L. FM demodulator circuit is provided with such characteristics as mentioned below.

In order to demodulate stereo composite signals, it is necessary to take a 19kHz pilot signal out of the stereo composite signals and to make it a 38kHz signal.

Most of the conventional methods to obtain such a 38kHz signal are frequency doubling ones which utilize a nonlinearity of the elements. Compared with the conventional type, the recently developed IC-ed demodulator provides more sufficient separation effects. However, since it also requires 2 or 3 coils like the conventional one, if even one of them is dislocated from the initially adjusted point due to a secular change the separation effects will be deteriorated. Moreover there is such a contradiction that the more the efficiencies of the coils are increased enough to withstand the outer pulse signals like automobil ignition noises, the more the coils suffer secular changes.

To eliminate such disadvantages as above, P.L.L. system is employed in the method to make a 38kHz signal using a 19kHz pilot signal.

The P.L.L. system stereo demodulator gives such three merits as:

① Since the phases of a pilot signal and a 38kHz signal are automatically made the same with each other, the deterioration of separation effect is strongly minimized.

② Since only one of variable resistor, being newly employed, plays the role of 2 to 3 pieces of conventional coils, troubles of the parts due to secular changes are decreased. In addition, even if this variable resistor is slightly dislocated, the separation effect will never be deteriorated because of the merit as mentioned in 1 by which the automatic phase adjustment is assured.

③ Compared with the conventional one, the P.L.L. system demodulator shows a more noise withstanding characteristic since it has such performances as the selection of frequencies and the continuity of oscillation frequencies (short-time memory); thus assuring a stable stereo demodulation.

2) FM stereo demodulator circuit of ST-3636H/ST-3636HB

IC301 is an integrated circuit for P.L.L. stereo demodulation and its block diagram is as shown in Fig. 22.

V.C.O. free-running frequency is to be adjusted to 76kHz by adjusting semi-fixed resistor VR301 (10K ohm). TP302 is the test point for frequency observation. (See the paragraph 'Adjustment' described later.)

During AM reception, +B voltage is supplied to the terminal ⑯ of IC301 through diode D301 and resistor R302 so that oscillation frequency of V.C.O. will be stopped.

Semi-fixed resistors VR302 (200K ohms) and VR303 (1meg. ohms) aim at the adjustment of stereo separation and with these resistors it is possible to minimize crosstalk to the opposite channel. By the way, the VR302 is effective for that purpose when the IF band is at 'wide' position while the VR303 when it is at 'normal' position.

FM muting signal is applied to the terminal ⑫ of IC301 to force stereo signals to become monaural ones.

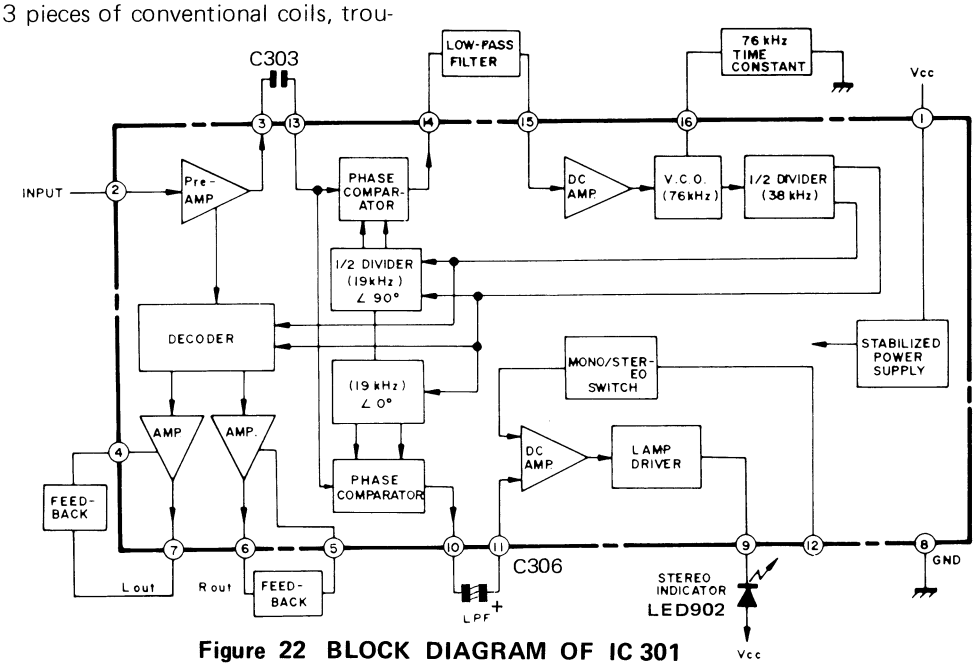


Figure 22 BLOCK DIAGRAM OF IC 301

VARIABLE AIR CHECK CALIBRATOR CIRCUIT

This circuit is to make appropriate the recording level in advance when recording FM broadcast into the tape deck or equivalent.

The circuit shown in Fig. 23 hereof is referred to as this variable air check calibrator circuit and it is composed of an air check oscillator circuit, air check meter indication circuit and further a circuit by which, when the air check/muting switch is set to 'air check on' position during FM reception, the indication mode of the signal/air check meter will be changed from 'signal level' to 'air check level' indication.

The oscillator circuit used for air check calibration consists of transistor Q703 and CR (capacitor and resistor), in which the oscillation frequency is about 400Hz. In other words, when the air check/muting switch (SW902) located at the front panel is set to 'air check on', the air check calibrator

circuit begins to operate and oscillation voltage appears at the output terminal (SO903) at the rear panel being as air check signal level. It is so adjusted by the air check level control (VR701) at the rear panel that: the air check signal level is set to 40% of the output voltage obtained when the tuner receives FM broadcast signal (modulation 100%, 75kHz deviation) and this level voltage appears at the output terminal of the rear panel through the air check oscillator circuit.

As far as this tuner is concerned, it is so designed that the air check signal level is variable nearly in the range from 20% to 80% when the air check level control (VR701) at the rear panel is operated--the signal level thus changed is indicated by the signal/air check level meter at the front panel.

VR702 is semi-fixed resistor which is used to adjust so that the air check signal level appearing at the output terminal becomes more than 80% (90% as standard) when the air check level control (VR701) is set to 'maximum' position.

The point ⓐ is a point from which the signal is applied to AF amplifier for the purpose of operating the audio monitor and air check meter drive amplifier. Meanwhile, it is possible to vary the air check level by changing the resistance of the air check variable control (VR701) connected to the point ⓐ.

Transistor Q702 is a circuit to allow the indication of air check level meter: in which the air check signal is amplified and it is double-voltage rectified by the diodes D702 and D902 so that the air check level meter will be able to indicate the value according to the air check level. Semi-fixed resistor VR901 is to be adjusted to have the air check level meter indicate the value '40%' simultaneously when the air check audio monitor is set to '40%'.

Transistor Q701 is to function during FM reception so that the signal/air check meter is changed from 'signal' indication to 'air check level' indication mode when the air check/muting switch is set to 'air check on' position. In other words, when the air check/muting switch is set to 'air check on', the air check calibrator circuit is activated and air check signal is produced at the collector of transistor Q703. To the collector of transistor Q703 is connected emitter follower type transistor Q701 having high-input impedance.

Output signal coming from the transistor Q703 is, through the transistor Q701, applied to the diode D701 connected to the emitter of the transistor Q701 so that it will be half-rectified, and the positive voltage thus rectified lets the transistor Q901 be turned on. The transistor Q901 is a circuit to make the signal meter drive signal be shorted, thereby eliminating a mis-operation of the signal/air check meter getting in 'signal indication' when it is at 'air check indication' mode.

AIR CHECK LEVEL CONTROL

With the air check level control it is possible to check in advance an appropriate recording level of FM broadcast to be recorded into a tape deck or the like. The air check signal level has been factory-adjusted to about 40% and if the level meter of the tape deck is adjusted to indicate '0VU' as a result of the signal of about 400Hz appearing at the output terminal, the recording can generally be carried out in a nearly proper recording level. Despite the above, it is necessary to change the recording level appropriately according to programs such as jazz, classical music and news, etc. in the case of FM reception. In compliance with this need, the air check signal level is made variable so as to change the recording level depending upon listeners' tastes. Actually, rotate the air check level control knob at the rear panel to establish the modulation (%) as desired and after that, adjust the recording level meter to indicate '0VU' position and proceed with the recording of FM broadcast. (For example, as for a music source having a larger dynamic range like classical music, it is recommended to adjust the air check level to the modulation 50% to 60% rather than the standard one (40%) and make the pointer of recording level indication of the tape deck go to the '0VU' position. It is thus allowed to carry out a less-distortion recording even for a large-signal source. On the other hand, the program source with a smaller dynamic range conversely requires the air check level being set to the modulation 20% to 30% so that the recorded sound will be assured of a better signal-to-noise ratio: if the level is otherwise set to more than 40% modulation, the noise level will suffer at the time of reproduction.)

Note:

In the case of AM reception, in other words, when the band selector switch is kept to the position AM, air check level signal does not appear at the output terminal located at the rear of the set since the air check calibrator is not functioning at the time.

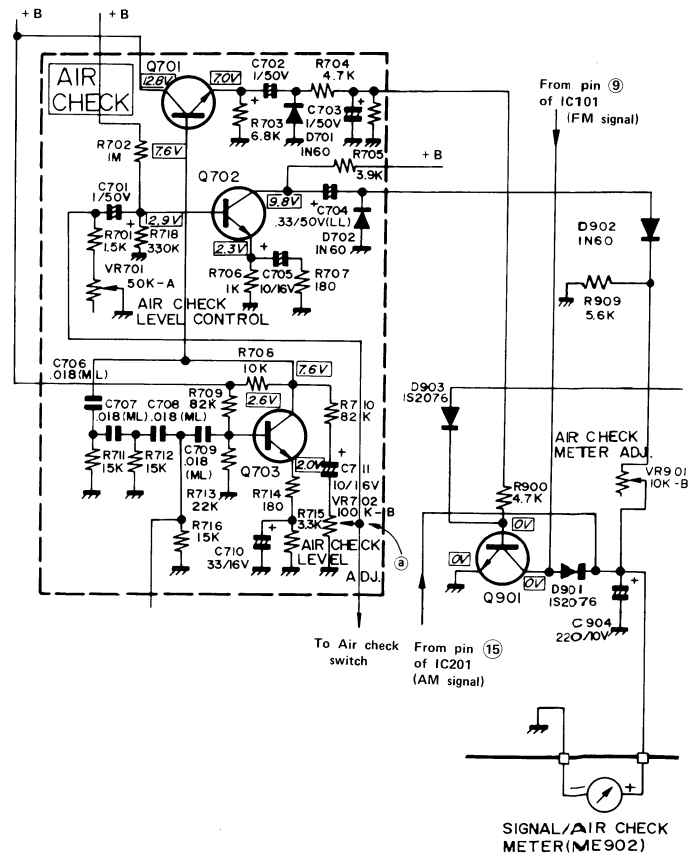


Figure 23 AIR CHECK CAL. CIRCUIT

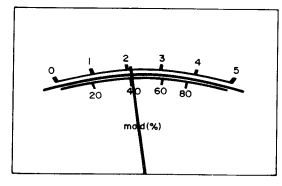


Figure 24 SIGNAL/AIR CHECK METER

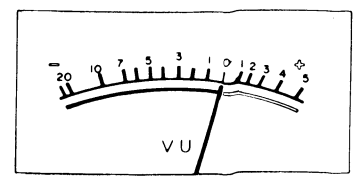


Figure 25 '0VU'

HI-BLEND CIRCUIT

The hi-blend circuit is composed of hi-blend switch (SW901) and capacitor C902 as shown in Fig. 26. If a stereo broadcast reception contains much noises, when the band selector switch is set to 'hi-blend' position, noises of both the right and left channels will be offset by each other since in the case of receiving the stereo broadcast, noises included in the both channels are at anti-phase relation from each other. This results in that the amount of noises is reduced so that the reproduced sound becomes more agreable to human ears. In this case, the stereo separation effect becomes, however, somewhat inferior in the high-frequency range.

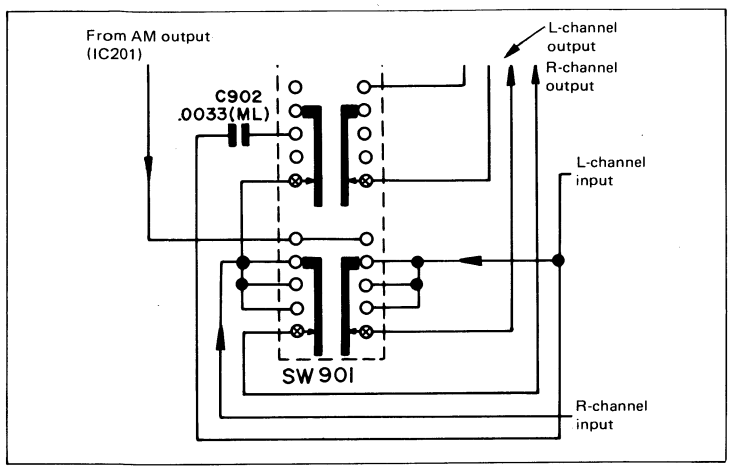


Figure 26

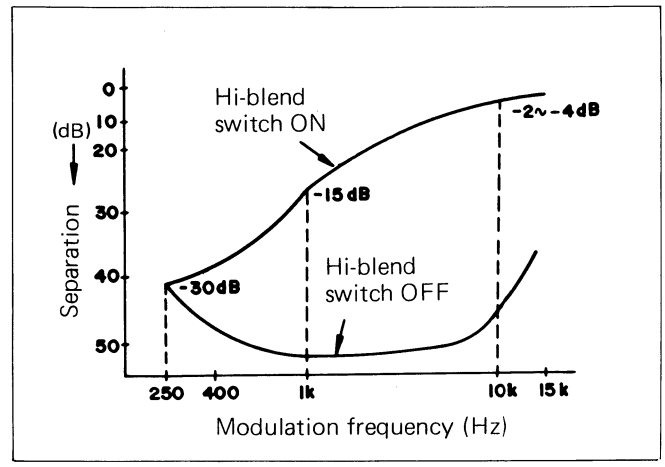


Figure 27 HI-BLEND CHARACTERISTIC

LOW-FREQUENCY AMPLIFIER CIRCUIT

1. Transistors Q401 and Q403 are for the left-channel amplification while those Q402 and Q404 for the right-channel amplification. This amplifier circuit serves in such a way that: output signal voltage from the P.L.L. multiplex demodulator is amplified to about 0.35V and to about 0.55V respectively by the fixed output terminal and the variable output terminal, and further that from the AM detection circuit is also amplified to about 0.2V and to about 0.35V respectively by the fixed and variable output terminals--this amplification suffers no distortion. In order to keep lower the output impedance, the output signal is taken out under a grounded-collector design (for the transistors Q403 and Q404). VR401 located at the front panel aims at varying the output voltage.
2. FL301 and FL302 are a low-pass filter that works to remove carrier signals leaking from the stereo P.L.L. multiplex demodulation IC301. Fig. 28 describes its characteristic as result of which the signals of 19kHz and 38kHz will be got rid of.

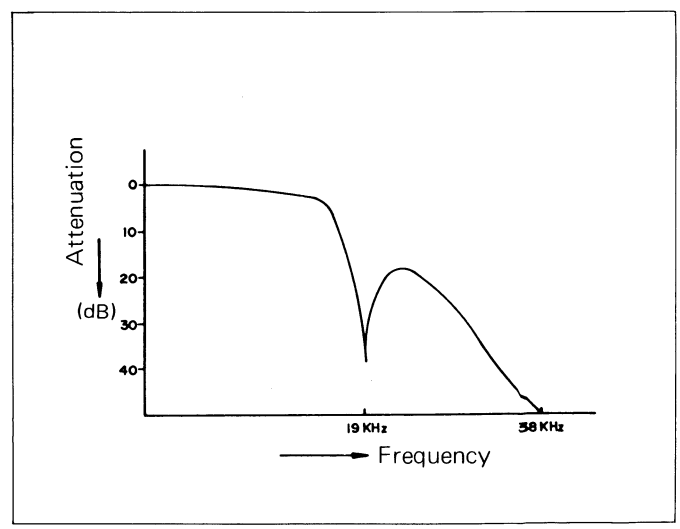


Figure 28 CHARACTERISTIC OF LOW-PASS FILTER

POWER SUPPLY CIRCUIT

In dealing with +B power supply, the power voltage is full-wave rectified by diodes D801 and D802 to be supplied to each section. Diode ZD801 is zener diode to be used for voltage regulation and the zener voltage is about 13.1V. Transistor Q801 is to remove ripples from the rectification current.

AUDIO MUTING CIRCUIT

The audio muting circuit is a circuit that functions to suppress shock sound or noise possibly caused when the power switch (SW904) of the tuner is turned on or off. This model ST-3636H/ST-3636HB is provided with two noise reduction circuits discussed below.

-1-Noise Reduction Circuit against AF (Low Frequency) Amplifier with Power Switch On and Off

When the power switch is turned on, base voltage of the transistors Q401 and Q402 is made to gradually rise up due to time constant assured by the capacitor C403 and resistor R401, so that probable shock noise is reduced to the minimum.

On the other hand, when the power switch is turned off, the diode D804 is cut off and +B voltage of AF amplifier becomes independent one so that it will gradually fall down due to time constant as a result of the capacitor C807 being discharged, thereby minimizing such shock noises.

-2-Noise Reduction Circuit against the Power Switch Being Turned On and Off.

When the power switch is turned on, the transistors Q604 and Q605 are turned on and this state can continue for about 3 seconds due to time constant assured by the resistors R604 and R606 and the capacitor C603, and therefore input voltage to the transistors Q401 and Q402 of the AF amplifier is suppressed so that possible shock noise be kept from occuring when the power switch is turned on.

On the other hand, when the power switch is turned off, having been cut off in a normal operation, the transistor Q601 is immediately turned on since the diode D803 stops rectification also immediately, and as a result the voltage once stored in the capacitor C603 is discharged, the transistor Q603 is cut off so that positive voltage be applied to the bases of the transistors Q604 and Q605--this leads to that the transistors Q604 and Q605 are turned on to make the sound subject for the muting operation, in this way, the sound is stopped without any noise simultaneously when the power switch is turned off.

The audio muting circuit is thus able to make the sound be perfectly free from incovenient shock noises even if the power switch is turned on and off repeatedly.

Besides, FM muting signal is applied to the base of the transistor Q602 so as to have the low-frequency section also be subjected to the muting operation.

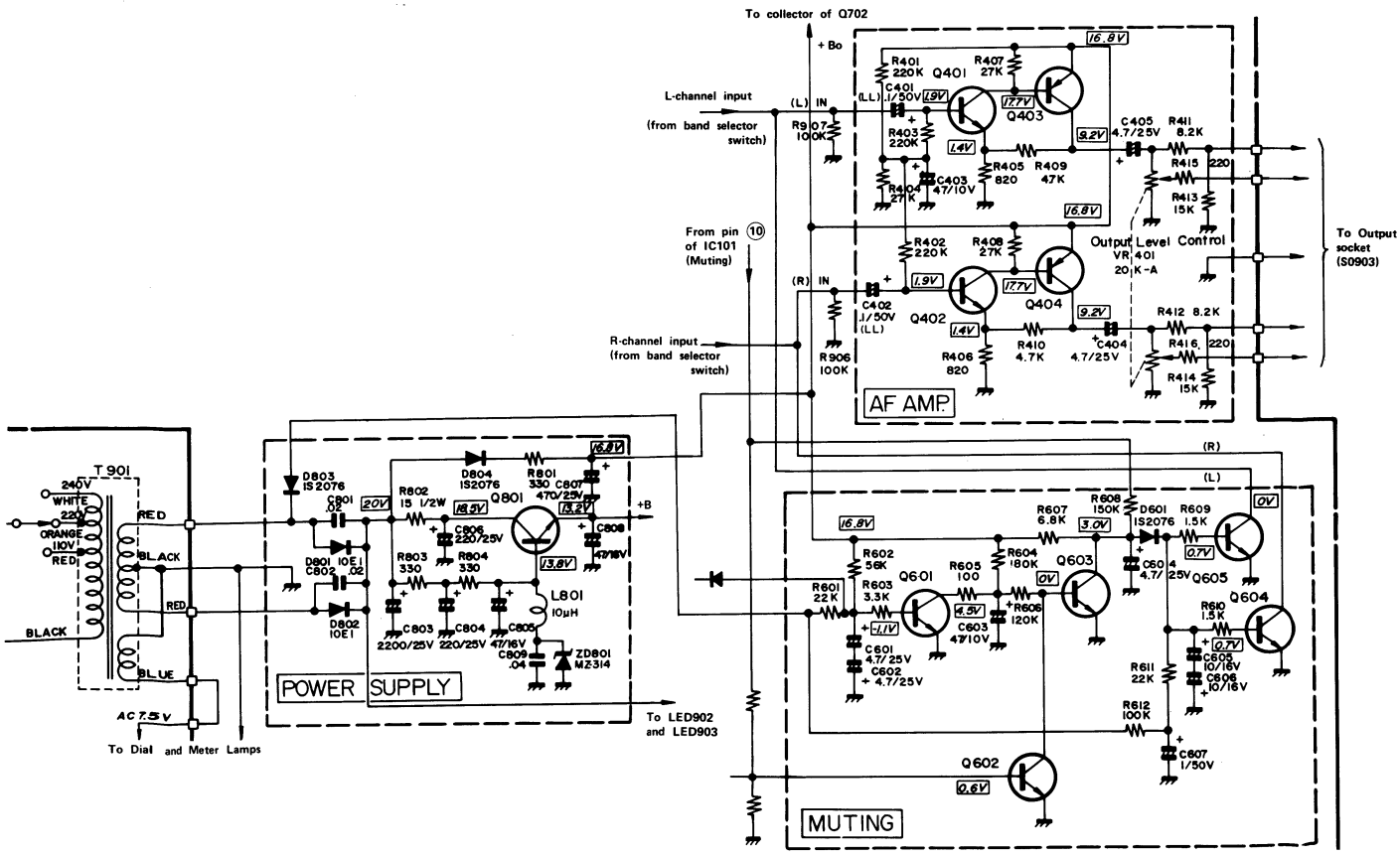


Figure 29 AUDIO MUTING CIRCUIT

ALIGNMENT INSTRUCTIONS

Alignment is an exacting procedure and should be undertaken only when necessary. If alignment of AM and FM is required, either section may be done first. The FM stereo section, however, should be done only if the FM monaural section is properly adjusted.

REQUIRED EQUIPMENT

1. Signal generator with a frequency range of 450 kHz to 1650 kHz; AM
2. Signal generator with a frequency range of 86.1 MHz to 109.2 MHz; FM
3. Signal generator with a frequency output of 10.7 MHz ± 0.5 MHz; FM
4. Vacuum tube voltmeter (AC-VTVM)
5. Sweep signal generator with a sweep range of at least 500 kHz and center frequency of 10.7 MHz with at least a 10.7 MHz marker may be used.
6. Oscilloscope with a wide range amplifier of approximately 100 kHz.
7. Test loops, a coil of any size wire, one turn or more; AM
8. Vacuum tube voltmeter (DC-VTVM)
9. FM stereo signal generator.
10. Audio signal generator with a frequency range of 20 Hz to 100 kHz.
11. Frequency counter with a frequency range of approximately 100 kHz.

Notes: Allow the set at least five minutes to warm up before attempting alignment. During alignment keep the signal generator output at the lowest level that will maintain a useble output from the set.

For the adjustment of stereo separation, the FM stereo generator output is usually 1,000μV. Incorrect grounding to the metal chassis may pick up an unwanted 10.7 MHz signal from the final IF stage, which will cause a regenerative sweep response on the sweep curve and result in misalignment.

Therefore always connect a ground to point.

Ground connection of signal generator	Chassis ground
Generator modulation (AM)	30%, 400 Hz
Generator modulation (FM)	40 kHz, 1000 Hz
Generator modulation (FM stereo)	Ch. L. or Ch. R. 40 kHz, 1,000Hz Mod.

THE INSTRUCTION OF FM FREQUENCY ADJUSTMENT

In order to comply with FTZ rule: Nr. 358 S757, please fix the low end of dial frequency (87.5 MHz) and high end of dial frequency (107.9 MHz) on FM band, by adjusting oscillation coil (L5) and oscillation trimmer (TC5), repectively, as illustrated in Figure 30.

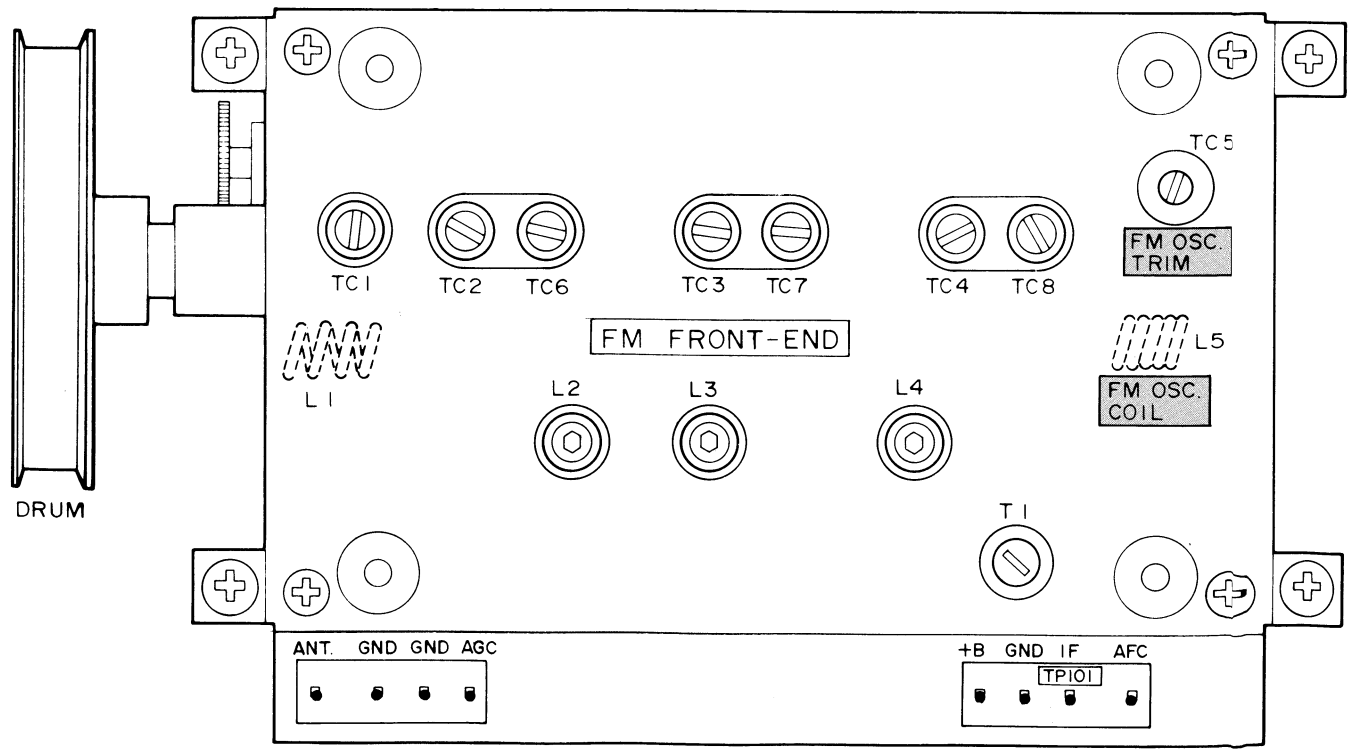


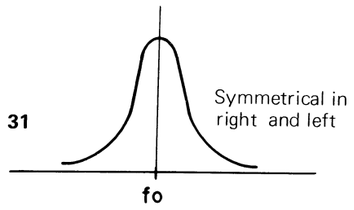
Figure 30 FM FRONT-END

AM IF/RF ALIGNMENT (See Figs. 31 and 32.)

Set the band selector switch (SW 901) to 'AM' position.

PROCEDURE NUMBER	TEST STAGE	SIGNAL GENERATOR		DIAL POINTER SETTING	METER CONNECTION	ADJUSTMENT	REMARKS
		CONNECTION	FREQUENCY				
1	IF	Connect AM sweep generator to TP2(TC7) and the terminal GND (earth). Keep the input be closed as much as possible.	455 kHz (400 Hz, 30 %, AM modulated)	High end of dial	Connect oscilloscope to TP201 and the earth.	T202, T203 (A marker position can be neglected since the transformer used is provided with ceramic filter.)	Rotate the cores of T202 and T203 so that the waveform becomes as shown in Fig. 31. (Repeat it two to three times.)
2	Frequency coverage	Connect AM signal generator to the loop antenna and place this assembly at near the bar antenna coil (L902). (Keep the input be closed as much as possible.)	515 kHz (400 Hz, 30 %, AM modulated)	Low end of dial	Connect VTVM to TP201 and the earth.	Local oscillation coil L201	Make the output be the maximum.
3		Same as above	1650 kHz (400 Hz, 30 %, AM modulated)	High end of dial	Same as above	Oscillation trimmer TC7	Same as above
4	Tracking	Same as above	600 kHz (400 Hz, 30 %, AM modulated)	Tuning in 600 kHz	Same as above	Antenna coil L902 and RF coil T201	Same as above
5		Same as above	1400 kHz (400 Hz, 30 %, AM modulated)	Tuning in 1400 kHz	Same as above	Antenna trimmer TC6 and RF trimmer TC8	Same as above
6	Repeat the steps 2 to 3 and those 4 to 5 until no further improvement can be made.						

Figure 31



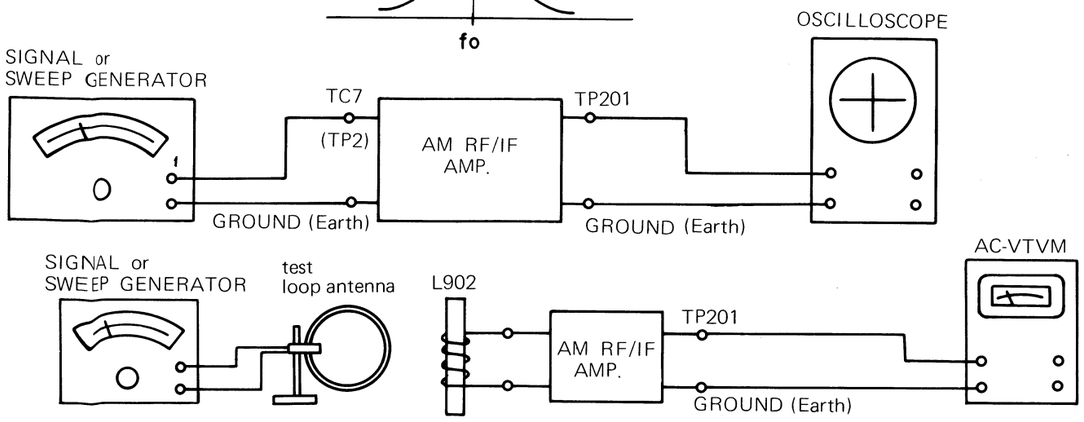


Figure 32 AM RF/IF ALIGNMENT EQUIPMENT CONNECTIONS

FM IF/RF ALIGNMENT (See Figs. 33, 34 and 35.)

Set the band selector switch (SW901) to 'FM mono' position.

PROCEDURE NUMBER	TEST STAGE	SIGNAL GENERATOR		DIAL POINTER SETTING	METER CONNECTION	ADJUSTMENT	REMARKS
		CONNECTION	FREQUENCY				
1	Make the test points TP 502 and TP503 be shorted -- this results in that the auto-lock circuit doesn't tend to operate.						
2	Set the IF band/multipath switch (SW903) to 'normal' position.						
3	IF (normal)	Connect FM sweep generator to the test point TP101 through 7pF capacitor. The earth is to be connected with the case of variable capacitor. (As to using a marker, refer to 'NOTE A'.)	Central frequency of ceramic filter	High end of dial	Connect oscilloscope to the test points TP102 and TP103 (earth).	T1	Rotate the core of T1 so that the waveform becomes symmetrical and highest as shown in Fig. 33.
4	Set the IF band/multipath switch (SW903) to 'wide' position and rotate the semi-fixed resistor VR141 fully to left.						
5	IF (wide)	Same as step 3 above	Same as step 3 above	Same as step 3 above	Same as step 3 above	T101, T102	Rotate the core of T101 so that the waveform becomes the highest. Rotate the core of T102 so that the waveform becomes symmetrical in right and left.
6	Set the IF band/multipath switch (SW903) to 'normal' from 'wide' and make sure the IF waveform's width becomes narrower than that obtained at the step 5 above.						
7	Set the IF band/multipath switch (SW903) to 'normal' while the muting/air check switch (SW902) to 'muting off'.						
8	Detection	Same as step 3 above	Same as step 3 above	Same as step 3 above	Connect oscilloscope to the test points TP301 and TP103 (earth).	T103, T104	Rotate the cores so that the waveform becomes as shown in Fig. 34 (symmetrical in up-and-down direction and best in linearity.)
9	Repeat the steps 1 to 8 until no further improvement can be made.						
10	Frequency coverage (* 1)	Connect FM signal generator to the antenna terminal. (Keep the input be closed as much as possible.)	88 MHz (1000 Hz, 40 kHz Dev., FM modulated.)	Low end of dial	Connect VTVM to the test point TP301 and the earth.	Local oscillation coil L5	Make the output be the maximum.
11		Same as above	108 MHz (1000 Hz, 40 kHz Dev., FM modulated.)	High end of dial	Same as above	Oscillation trimmer TC5	Same as above
12	Tracking (* 1)	Same as above	90 MHz (1000 Hz, 40 kHz Dev., FM modulated.)	Tuning in 90 MHz	Same as above	RF coils L2, L3 and L4 and antenna coil L1	Same as above
13		Same as above	106 MHz (1000 Hz, 40 kHz Dev., FM modulated.)	Tuning in 106 MHz	Same as above	RF trimmers TC2, TC3 and TC4 and antenna trimmer TC1	Same as above
14	Repeat the steps 10 to 13 until no further improvement can be made.						
15	After all of the adjustments, make the test points TP502 and TP503 be disconnected from each other.						

(* 1) As for FM high-frequency range (front-end section), since it has been already adjusted, do not rotate the coils and trimmers unless the adjustment becomes necessary -- readjust the FM-high frequency only when it suffers a considerable disalignment.

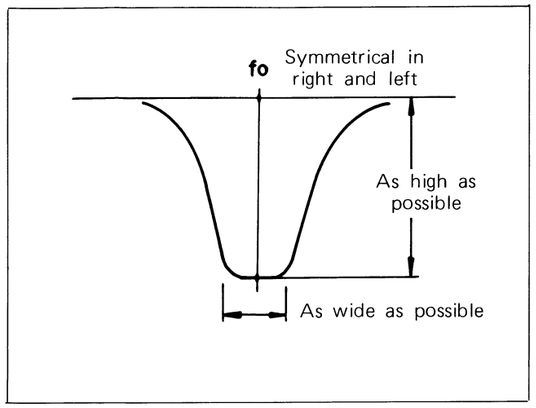


Figure 33

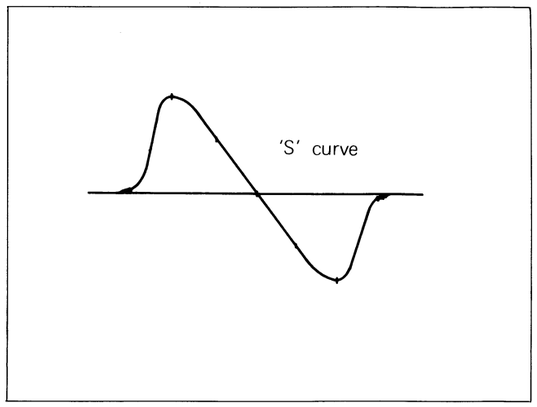
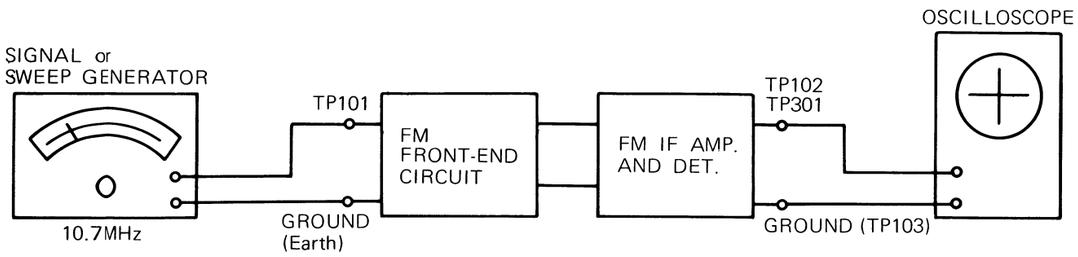


Figure 34



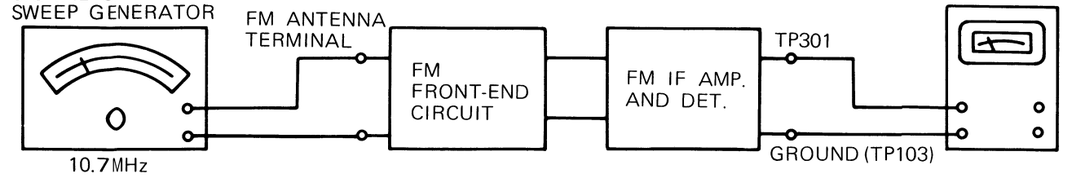


Figure 35 FM ALIGNMENT EQUIPMENT CONNECTIONS

Note A

The ceramic filter used for this set is available in 3 types and each of them is given a color indication to differentiate the central frequency from that of the others, as described below. In the actual use, be sure to make 4 ceramic filters of the same type (the same color) as a pair to put them in the set. When other ceramic filters than that given red color indication (with the central frequency of 10.7MHz) are used, note that with such filters the marker (10.7MHz) of FM sweep generator will be deviated; therefore be sure to cut off the marker at the time of the adjustment.

Central frequency (fo)	B	Blue	10.67 MHz ± 0.03 MHz
	A	Red	10.70 MHz ± 0.03 MHz
	C	Orange	10.73 MHz ± 0.03 MHz

(4 ceramic filters to be used in a set as a pair should be of the same type (the same color).)

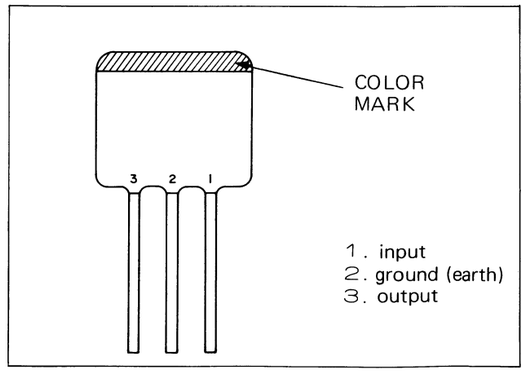


Figure 36

ADJUSTMENT OF FM TUNING METER, SIGNAL METER AND DISTORTION FACTOR

1. Make the test points TP502 and TP503 be shorted -- this results in that the auto-lock circuit won't operate.
2. Set the band selector switch (SW901) to 'FM mono', position.
3. Connect a 300-ohm dummy resistor and FM signal generator to the FM antenna terminal (300 ohms). Keep the output of FM signal generator be closed as much as possible (to produce no signal).
4. Keeping the IF band/multipath switch (SW903) to 'normal' position, adjust the core of T103 so that the tuning meter's pointer will indicate the center (with the dial position being at around 98 MHz.)
5. Adjust T102 so that the tuning meter's pointer can indicate the center even if the position of IF band/multipath switch is changed to 'wide' from 'normal'.
6. Setting the IF band/multipath switch to 'normal', make the output of FM signal generator be 1000 Hz (40 kHz deviation), adjust the signal meter so that its pointer will indicate the graduation '3'.
   Adjust the semi-fixed resistor VR141 so that the signal meter's pointer won't come off the graduation '3' even if the position of IF band/multipath switch is changed to 'wide' from 'normal' and vice versa.
7. Make the output of FM signal generator be 1000 Hz [40 kHz deviation, 60 dB (1 mV)], and keeping the IF band/multipath switch to 'wide', rotate the core of T104 to adjust so that the distortion factor goes down to the minimum.
8. Repeat the steps 1 to 7 untii no further improvement can be made.
9. After the adjustments, have the test points TP502 and TP503 be disconnected from each other.

FM AUTO LOCK/MUTING ADJUSTMENT

1. Keeping the band selector switch (SW901) to 'FM mono' position, connect a 300-ohm dummy resistor and FM signal generator to the FM antenna terminal (300 ohms).
2. Meke the test points TP502 and TP503 be shorted -- this results in that the auto lock circuit won't operate.
3. Meke the output of FM signal generator be 98 MHz and 1000 Hz [40 kHz deviation, 60 dB (1 mV)] and let the set be tuned in such signal with the tuning meter's pointer being at the center.
4. Under this condition, have the test points TP502 and TP 503 be disconnected from each other.
5. Make the test points TP502 and TP103 be shorted so as to get the auto-lock circuit be locked. [With the circuit being locked, the light emitting diode (LED903) of the locked indicator lights up.]
6. Despite the above, if the locked indicator is found to blink repeatedly, rotate the semi-fixed resistor VR501 until it will be able to light up completely. At the time, see that the tuning meter's pointer is coming to the center.
7. Make the output of FM signal generator be 20 dB and keeping the muting/air check switch to 'muting on', rotate the semi-fixed resistor VR142 to adjust so that the signal can undergo the muting with the output of FM signal generator being set to 20 dB.
8. After the adjustments, have the test points TP502 and TP103 be disconnected from each other.

FM STEREO V.C.O. FREE-RUNNING FREQUENCY ADJUSTMENT AND SEPARATION ADJUSTMENT

(See Fig. 37)

1. Set the band selector switch (SW901) to 'FM stereo' position while the air check/muting switch to 'muting off' position. Connect FM signal generator to FM antenna terminal of the set and regulate the oscillation frequency to 98 MHz (40 kHz deviation, 1000 Hz) and the output to 60 dB. Then tune the set exactly in such signal.
2. Connect VTVM, through a 2.2-meg ohm resistor, to the test point TP302 and a frequency counter to the output terminal of VTVM.
3. Make the test point TP301 and the earth (TP103) be connected and adjust the semi-fixed resistor VR301 so that V.C.O. free-running frequency will be 76 kHz ± 200 Hz. (After the adjustment of V.C.O. frequency, have the test point TP301 and the earth (TP103) be disconnected.)
4. Connect FM stereo modulator to FM signal generator. At the time, the following should be set: modulation frequency; 1 kHz [L + R; 20 kHz dev., L – R; 20 kHz dev., and pilot signal (19 kHz); 6 kHz deviation].
   Connect such signal of FM signal generator to the FM antenna terminal. (Set the frequency of FM signal generator to 98 MHz and its output to 60 dB.)
5. Keeping the IF band/multipath switch to 'wide' position, heve the set be tuned in the signal so that the tuning meter will indicate the center. Set the stereo modulator so as to cause modulation only in L-channel and consider the output of L-channel as 0 dB (at the fixed terminal).
6. Connect VTVM to the fixed output terminal (R-channel) of the set and to the earth and adjust the semi-fixed resistor VR302 so that the separation becomes maximum (the output leaking to the opposite channel is minimized). Repeat the above procedures until the outputs of both channels will be equal to each other.
7. Keeping the IF band/multipath switch to 'normal' position, set the stereo modulator so as to cause modulation only in R-channel and consider the output of R-channel as 0 dB (at the fixed terminal).
8. Connect VTVM to the fixed output termianl (L-channel) and adjust the semi-fixed resistor VR303 so that the separation becomes maximum. (the output leaking to the opposite channel is minimized). Repeat the above procedures until the outputs of both channels will be equal to each other.
9. Finally readjust the distortion factor in FM stereo reception in such a way that: Setting the IF band/multipath switch to 'normal' position, rotate the core of T1 to adjust so that the distortion factor will be minimized (with the input 60 dB). At the time, take care not to rotate the core excessively. After the readjustment of the said core, see that the tuning meter's pointer doesn't come off the center when there is no signal given.

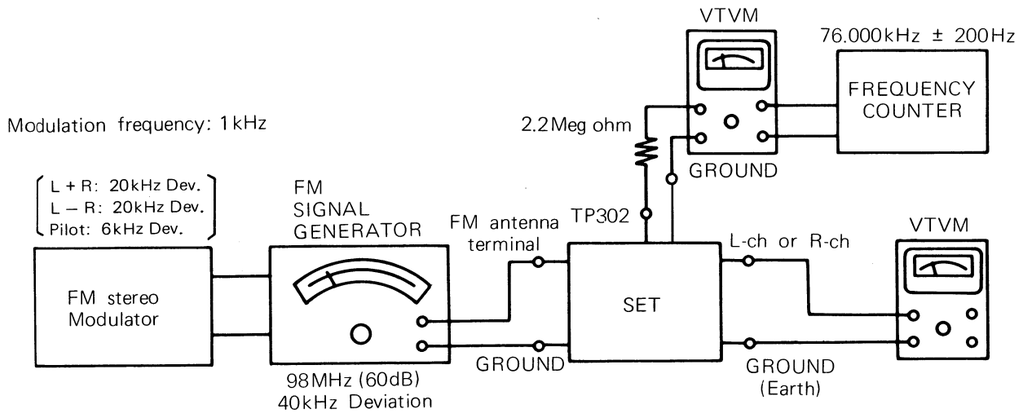


Figure 37 FM STEREO ALIGNMENT EQUIPMENT CONNECTIONS

AIR CHECK LEVEL ADJUSTMENT AND MULTIPATH CHECK (Set the band selector switch to 'FM mono' position.)

1. Set the air check/muting switch (SW902) to 'air check on' position and turn the air check level control (VR701) at the rear panel fully clockwise.
2. While rotating the semi-fixed resistor VR702, measure voltage at both the L-channel and R-channel output terminals.
   Connect a standard signal generator to the antenna terminal and set output signal of this generator to 98 MHz (60 dB, 1000 Hz, 100 % modulation) and adjust the semi-fixed resistor VR702 so that there will be output voltage (air check signal level) which is 90 % of that available for the first time at the output terminal.
3. Rotate the air check level control (VR701) counterclockwise to adjust so that the air check signal level (output voltage) at the output terminal will be 40 % of the original one.
4. Adjust the semi-fixed resistor VR901 so that the pointer of air check indication meter located at the front panel will be at the indication '40 %'. As a result of the adjustment, the air check signal level at the output terminal becomes identical to the indication value of the air check meter.
5. Set the multipath/IF band switch to 'monitor' position and adjust T105 so that the output frequency obtained then will be 2000 Hz (two times the modulation frequency 1000 Hz). Observe the waveform by using an oscilloscope.

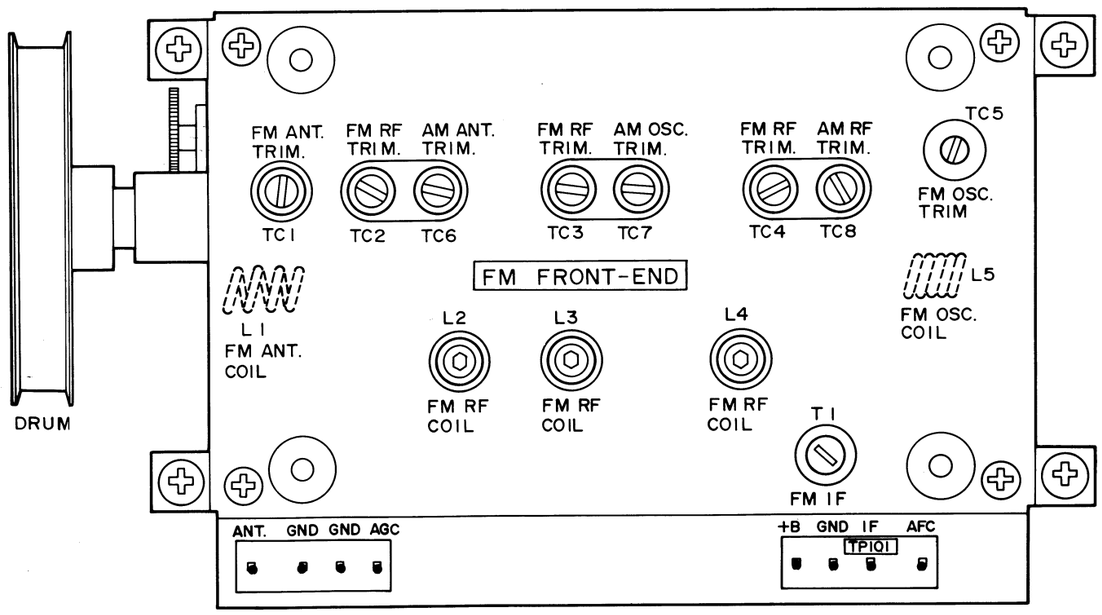


Figure 38 ALIGNMENT POINTS (FM FRONT-END CIRCUIT)

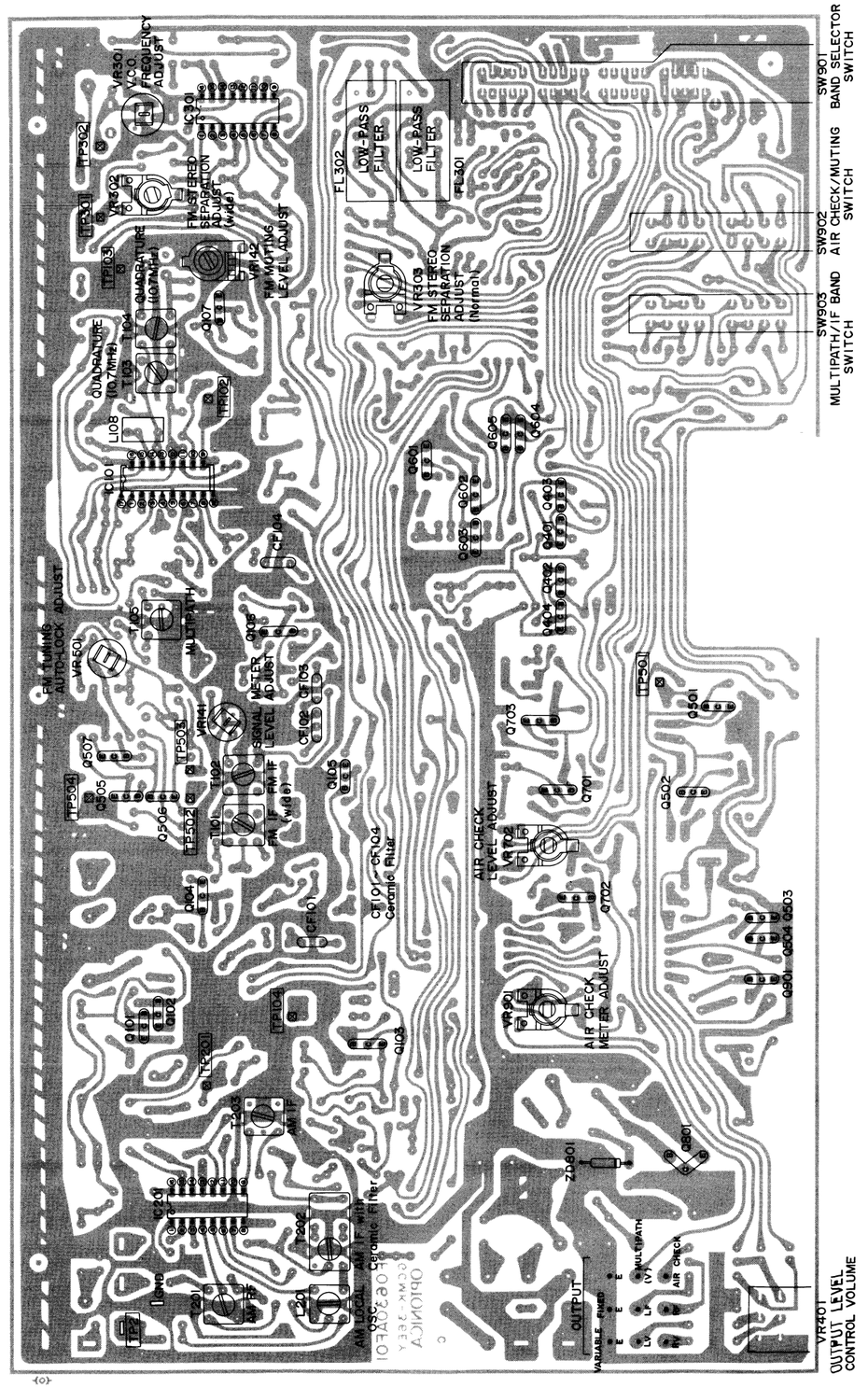
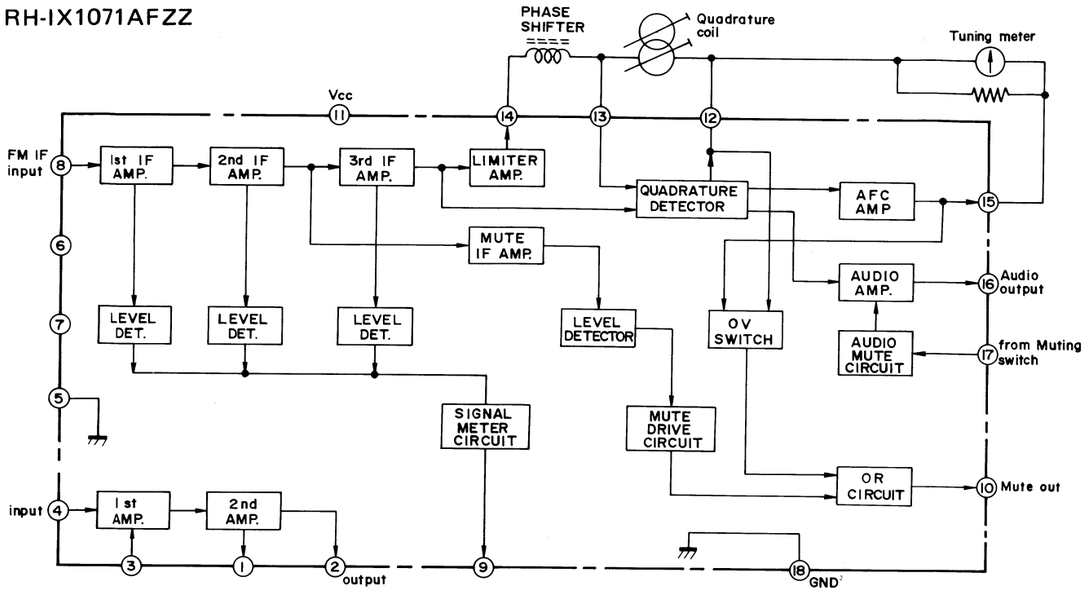
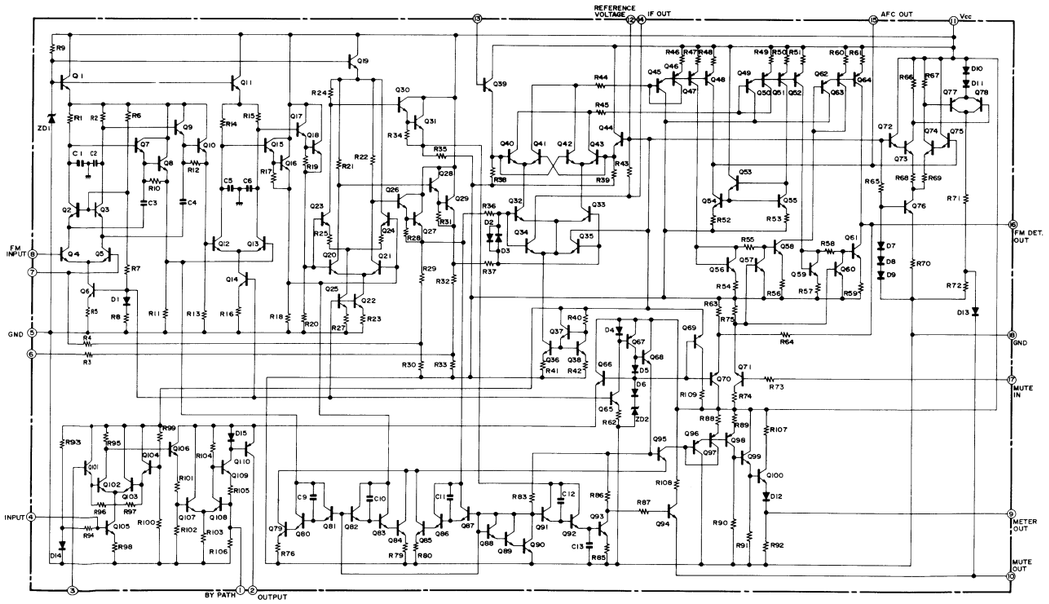


Figure 39 ALIGNMENT POINTS (MAIN CIRCUIT)

RH-IX1071AFZZ





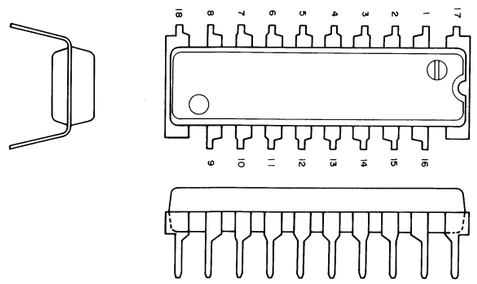
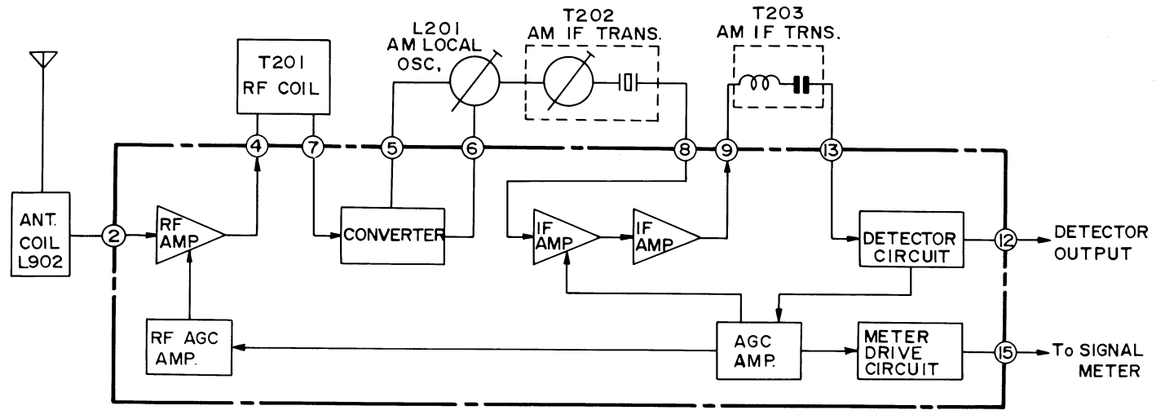
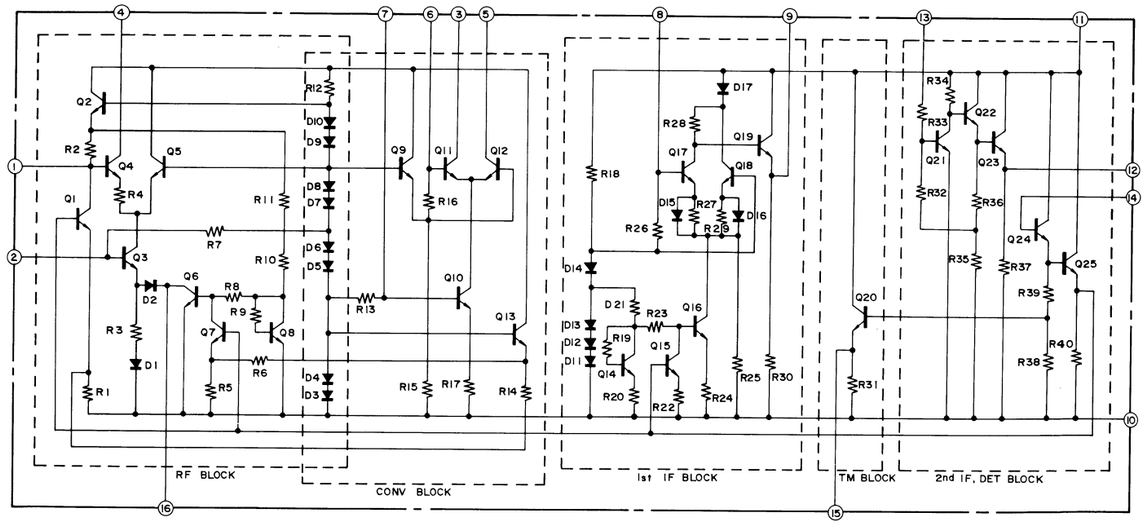


Figure 40 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC 101)

RH-IX1072AFZZ



IC-201 AM RF/IF AMP. AND DETECTOR



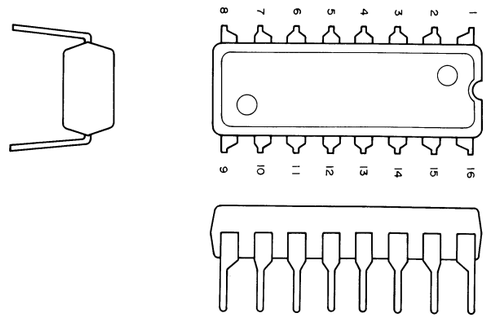
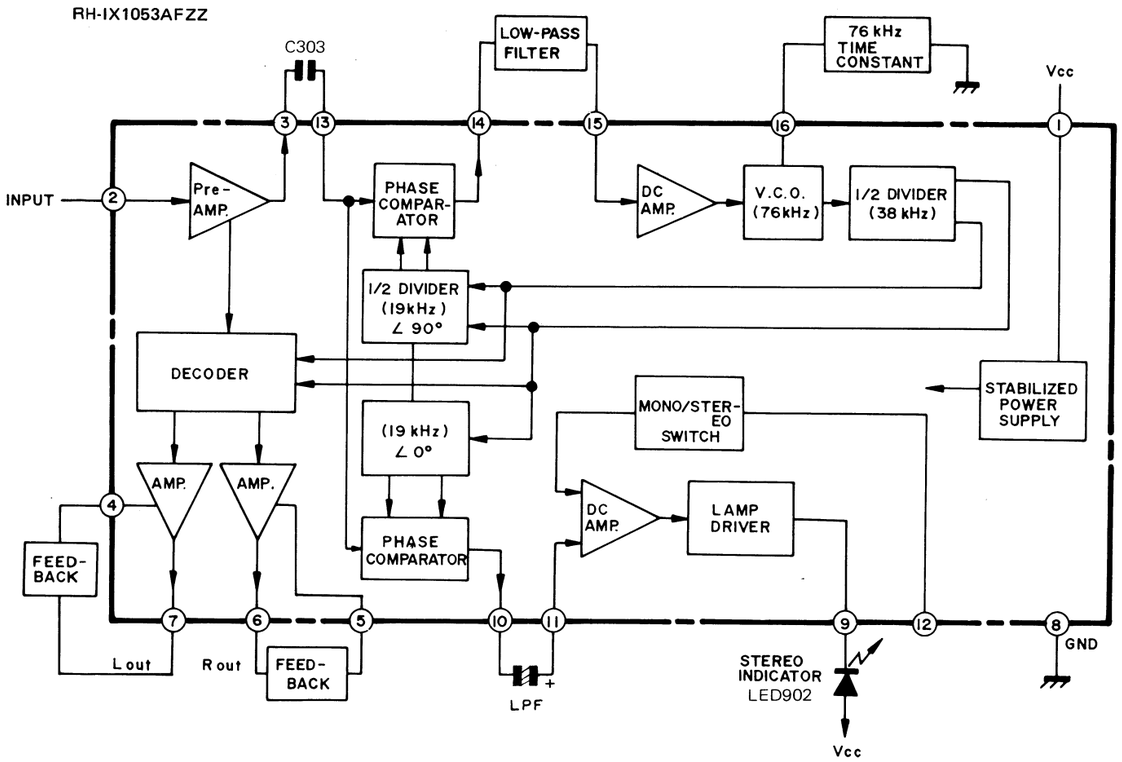


Figure 41 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC 201)



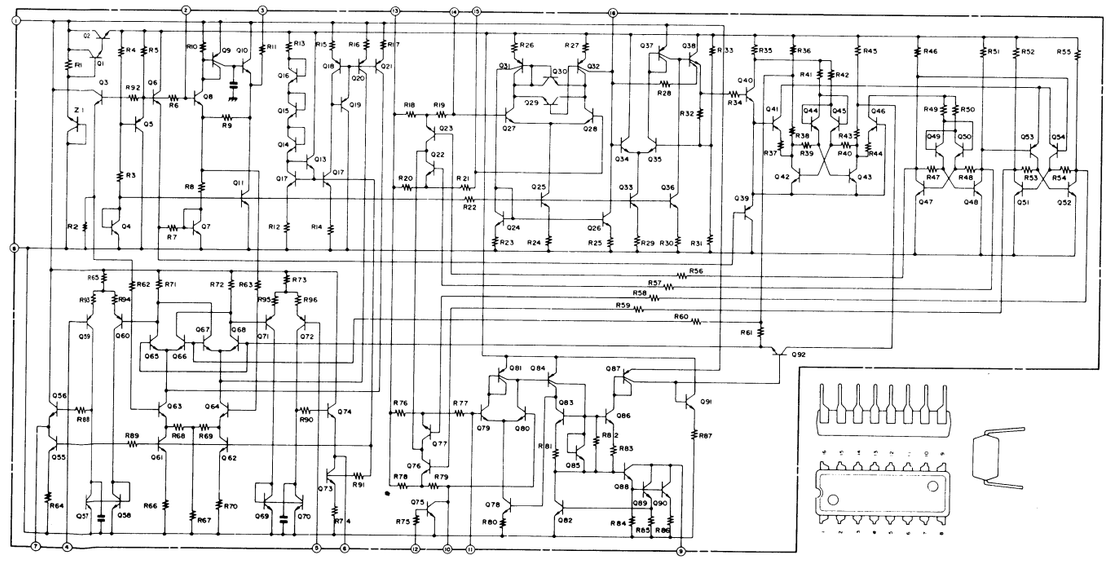


Figure 42 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC 301)

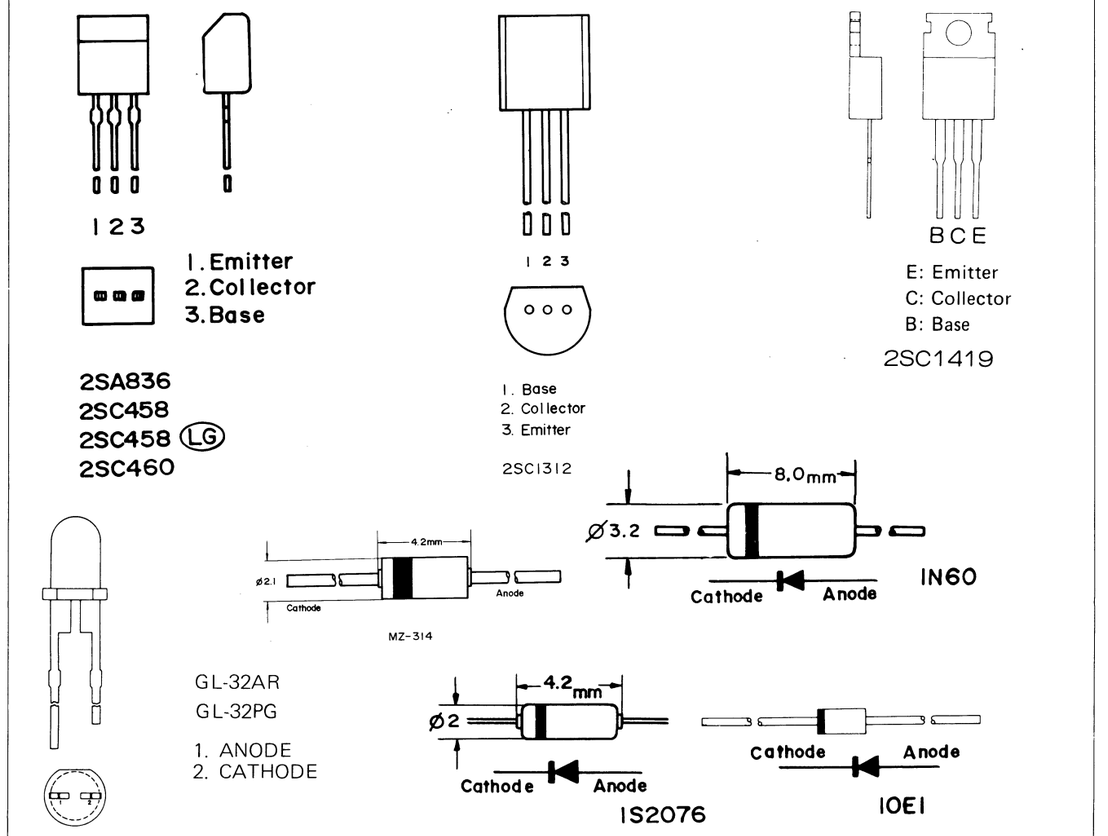
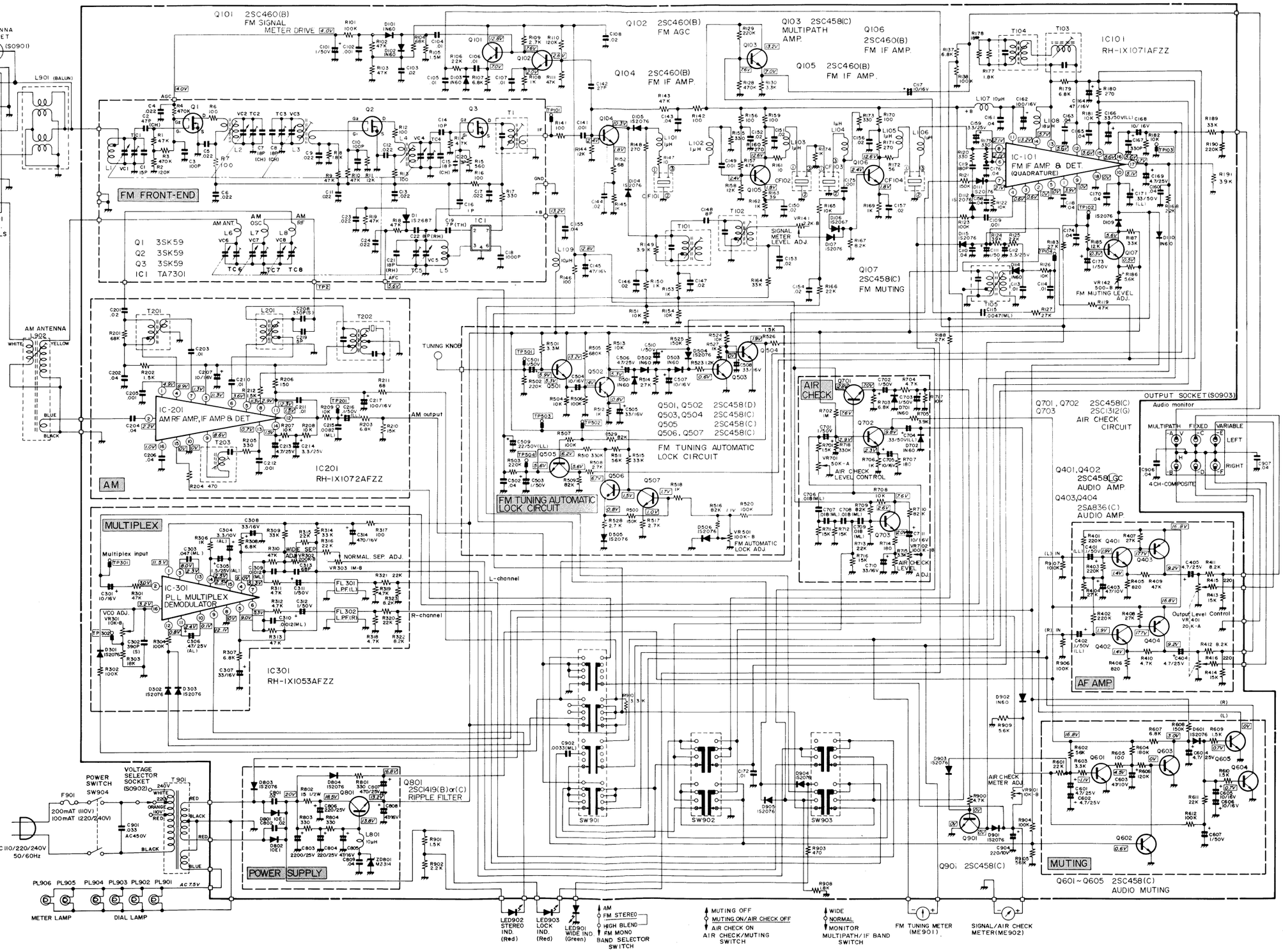


Figure 43 TRANSISTOR AND DIODE TYPES

NOTES ON SCHEMATIC DIAGRAM

1. Frequency range: FM; 87.6 to 108 MHz
   AM; 520 to 1620 kHz
2. IF: FM 10.7 MHz, AM 455 kHz
3. Resistor: To differentiate the units of resistors, such symbol as K and M are used: the symbol K means KΩ and that M means MΩ and the resistor without any symbol is Ω-type resistor.
4. Capacitor: To indicate the unit of capacitor, a symbol P is used; this symbol refers to pF and the unit of the capacitor without such symbol is μF. As to electrolytic capacitor, the expression 'capacitance/withstand voltage' is used. Further the symbols ML and S as to the capacitor show respectively mylar type and styrol type capacitor: the capacitor without any of those two symbols refers to a ceramic capacitor.
5. SW901: It is Band selector (AM/FM stereo/FM hi-blend/FM mono) switch ('FM stereo' position).
6. SW902: It is Air check/muting switch ('air check off/muting on' position).
7. SW903: It is Multipath/IF band switch ('normal' position).
8. SW904: It is Power (on/off) switch ('off' position).
9. The indicated voltage in each section is the one measured by VTVM between such a section and the chassis with no signal being given. Besides the voltage measurement is to be made under the following: as for the voltage of IC201, keep the band selector switch to 'AM' position while for the others, set the band selector switch to 'FM stereo' and the air check/muting switch to 'muting on' position.



(Specifications or wiring diagrams of this model are subject to change for the improvement without prior notice.)

Figure 44 SCHEMATIC DIAGRAM

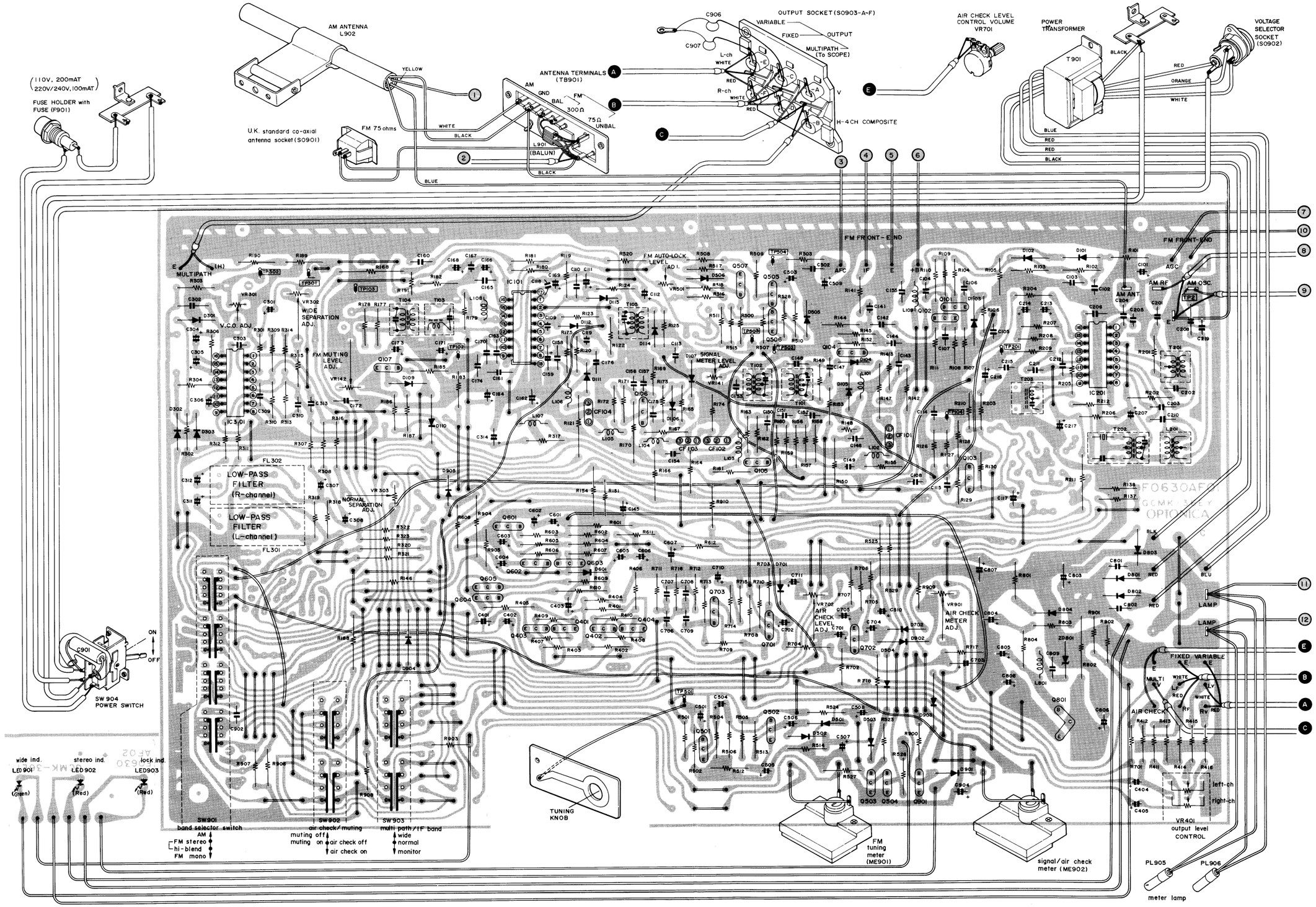


Figure 45 WIRING SIDE OF P.W. BOARD

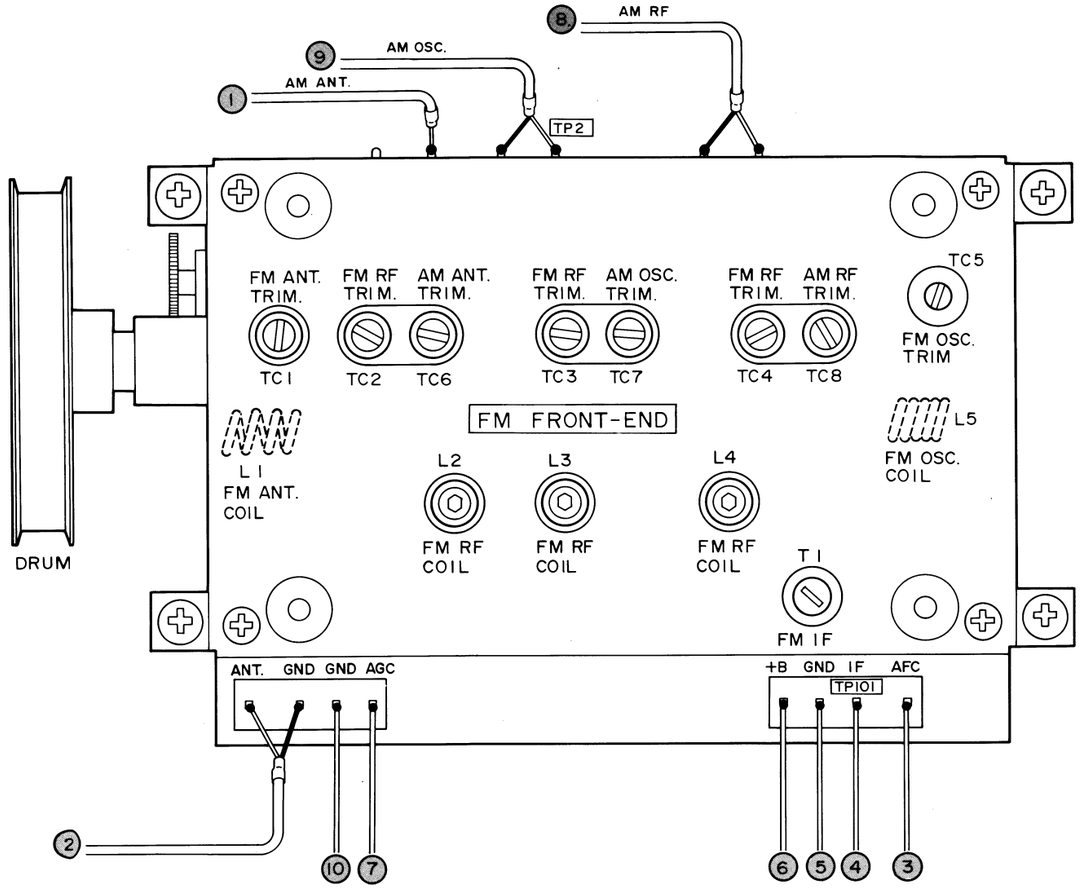


Figure 46 FM FRONT-END

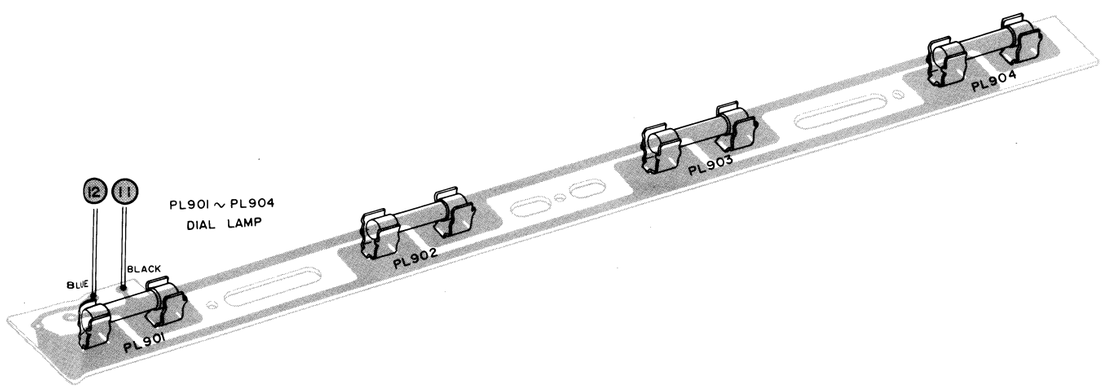
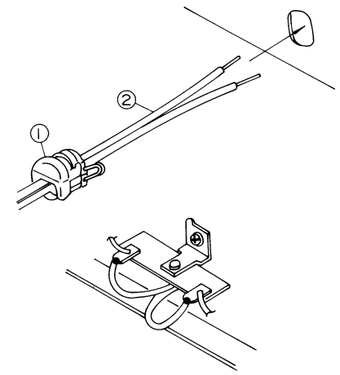
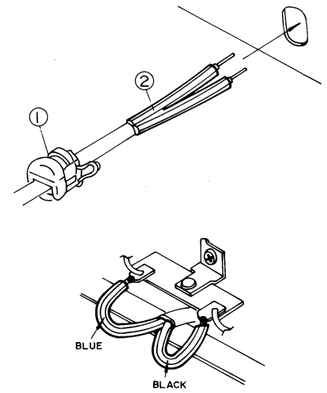


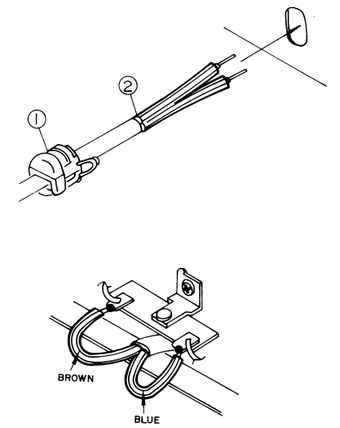
Figure 47 DIAL LAMP CONNECTIONS



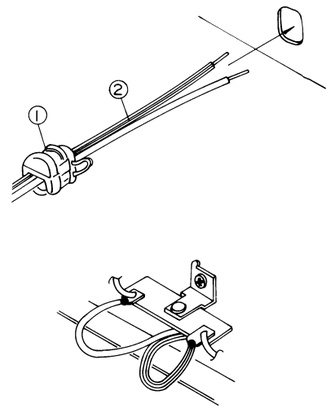
① (BUSHING)	② (POWER SUPPLY CORD)
LBSHC0007AFZZ	QACCZ0002AG08 (QPLGA0201AGZZ)
	QACCZ0002TA0F



① (BUSHING)	② (POWER SUPPLY CORD)
LBSHC0004AGZZ	QACCV0001AGZZ

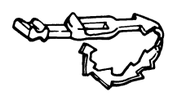


① (BUSHING)	② (POWER SUPPLY CORD)
LBSHC0004AGZZ	QACCB0052AF09

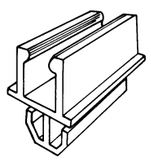


① (BUSHING)	② (POWER SUPPLY CORD)
LBSHC0007AFZZ	QACCL0001AFZZ

Figure 48 POWER SUPPLY CORD WIRING CONNECTIONS

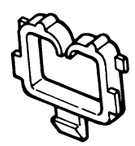


LHLDW1052AFZZ



LHLDF1204AFZZ

LX-LZ0054AF00



LHLDW1057AFZZ

LX-LZ0051AF00

Figure 49

REPLACEMENT PARTS LIST

"HOW TO ORDER REPLACEMENT PARTS"

To have your order filled promptly and correctly, please furnish the following informations.

1. MODEL NUMBER
2. REF. NO.
3. PART NO.
4. DESCRIPTION

REF. NO.	PART NO.	DESCRIPTION	CODE
		INTEGRATED CIRCUITS	
IC101	RH-IX1071AFZZ	FM IF Amplifier and Detector (Quadrature) (HA11211)	AS
IC201	RH-IX1072AFZZ	AM RF/IF Amplifier and Detector (HA1197)	AN
IC301	RH-IX1053AFZZ	P.L.L. Multiplex Stereo Demodulator (HA1196)	AP
		TRANSISTORS	
Q101	VS2SC460-B/-1	FM Signal Meter Drive (2SC460Ⓑ)	AC
Q102	VS2SC460-B/-1	FM AGC (2SC460Ⓑ)	AC
Q103	VS2SC458-C/-1	Multipath Distortion Amplifier (2SC458Ⓒ)	AC
Q104	VS2SC460-B/-1	FM IF Amplifier (2SC460Ⓑ)	AC
Q105	VS2SC460-B/-1	FM IF Amplifier (2SC460Ⓑ)	AC
Q106	VS2SC460-B/-1	FM IF Amplifier (2SC460Ⓑ)	AC
Q107	VS2SC458-C/-1	FM Muting (2SC458Ⓒ)	AC
Q401, Q402	VS2SC458LGC-1	Audio Amplifier (2SC458(LG)C)	AD
Q403, Q404	VS2SA836-C/-1	Audio Amplifier (2SA836Ⓒ)	–
Q501	VS2SC458-D/-1	FM Tuning Auto-Lock Circuit, Touch Switch (2SC458Ⓓ)	AC
Q502	VS2SC458-D/-1		AC
Q503	VS2SC458-C/-1	FM Tuning Auto-Lock Circuit, Touch Switch (2SC458Ⓒ)	AC
Q504	VS2SC458-C/-1		AC
Q505	VS2SC458-C/-1	FM Tuning Auto-Lock Circuit (2SC458Ⓒ)	AC
Q506	VS2SC458-C/-1		AC
Q507	VS2SC458-C/-1		AC
Q601	VS2SC458-C/-1		AC
Q602	VS2SC458-C/-1		AC
Q603	VS2SC458-C/-1	Audio Muting (2SC458Ⓒ)	AC
Q604	VS2SC458-C/-1		AC
Q605	VS2SC458-C/-1		AC
Q701	VS2SC458-C/-1	Air Check Circuit, Meter Indication (2SC458Ⓒ)	AC
Q702	VS2SC458-C/-1	Air Check Circuit, Meter Indication (2SC458Ⓒ)	AC
Q703	VS2SC1312-G-1	Air Check Circuit, Oscillation (2SC1312Ⓖ)	AC
Q801	VS2SC1419-K1F	Ripple Filter (2SC1419Ⓑ or Ⓒ)	AG
Q901	VS2SC458-C/-1	Meter Indication Selector (2SC458Ⓒ)	AC
		DIODES	
D101	VHD1N60////-1	FM AGC (1N60)	AB
D102	VHD1N60////-1	FM AGC (1N60)	AB
D103	VHD1N60////-1	FM Signal Meter (1N60)	AB
D104	VHD1S2076//-1	FM IF Band Width Selector (1S2076)	AB
D105	VHD1S2076//-1		AB
D106	VHD1S2076//-1		AB
D107	VHD1S2076//-1		AB
D109	VHD1S2076//-1	FM Muting (1S2076)	AB
D110	VHD1N60////-1	FM Muting (1N60)	AB
D111	VHD1S2076//-1	+B Rectifier (1S2076)	AB
D112	VHD1S2076//-1	Multipath Operation (1S2076)	AB
D114	VHD1N60////-1	AM Detector (1N60)	AB
D115	VHD1S2076//-1	Multipath (1S2076)	AB
D301	VHD1S2076//-1	V.C.O. Frequency Stopper (1S2076)	AB
D302	VHD1S2076//-1	+B Rectifier (1S2076)	AB
D303	VHD1S2076//-1	FM Muting (1S2076)	AB
D501	VHD1N60////-1	FM Tuning Auto-Lock Circuit, Rectifier (1N60)	AB
D502	VHD1N60////-1		AB
D503	VHD1N60////-1	FM Tuning Auto-Lock Circuit, Rectifier (1N60)	AB
D504	VHD1S2076//-1	FM Tuning Auto-Lock Circuit, Muting (1S2076)	AB
D505	VHD1S2076//-1	FM Tuning Auto-Lock Circuit, Temperature Compensation (1S2076)	AB
D506	VHD1S2076//-1		AB
D601	VHD1S2076//-1	Audio Muting (1S2076)	AB
D701	VHD1N60////-1	Air Check Circuit, Rectifier (1N60)	AB
D702	VHD1N60////-1	Air Check Circuit, Rectifier (1N60)	AB
D801	VHD10E1////-1	Power Rectifier (10E1)	AC
D802	VHD10E1////-1	Power Rectifier (10E1)	AC
D803	VHD1S2076//-1	Audio Muting, Rectifier (1S2076)	AB
D804	VHD1S2076//-1	Audio Muting, Rectifier (1S2076)	AB
D901	VHD1S2076//-1	FM Signal Meter (1S2076)	AB
D902	VHD1N60////-1	Air Check Circuit, Rectifier (1N60)	AB
D903	VHD1S2076//-1	Signal/Air Check Meter (1S2076)	AB
D904	VHD1S2076//-1	IF Wide Position (1S2076)	AB
D905	VHD1S2076//-1	Multipath (1S2076)	AB
LED901	VHPGL32PG//-1	Light Emitting Diode, Wide Indicator, Green (GL-32PG)	AF
LED902	VHPGL32AR//-1	Light Emitting Diode, Stereo Indicator, Red (GL-32AR)	AD
LED903	VHPGL32AR//-1	Light Emitting Diode, Lock Indicator, Red (GL-32AR)	AD
ZD801	VHEMZ314A//1F	Zener Diode, Voltage Regulator (13.1V ± 0.5V) (MZ-314(A))	AC
		COILS	
L101	VP-LH1R0M0000	1μH, Phase Compensation	AB
L102	VP-LH1R0M0000		AB
L103	VP-LH1R0M0000		AB
L104	VP-LH1R0M0000		AB
L105	VP-LH1R0M0000		AB
L106	VP-LH1R0M0000		AB
L107	VP-LH100M0000	10μH, +B Choke	AB
L108	RCILZ0052AFZZ	18μH, Phase Shifter	AB

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
L109	VP-LH100M0000	10μH, +B Choke	AB
L201	RCILB0395AFZZ	AM Local Oscillation	AD
L801	VP-LH100M0000	10μH, Choke	AB
L901	RCILA0231AFZZ	Balun (Antenna Matching)	AD
L902	RCILA0413AFZZ	AM Bar Antenna	AQ
		TRANSFORMERS	
T101	RCILD0004SEZZ	FM IF, Wide Position	AE
T102	RCILD0004SEZZ	FM IF, Wide Position	AE
T103	RCILD0053AFZZ	Quadrature (10.7MHz)	AE
T104	RCILD0054AFZZ	Quadrature (10.7MHz)	AE
T105	RCILI0060AGZZ	Multipath (Doubler)	AE
T201	RCILR0314AFZZ	AM RF	AD
T202	RCILI0200AFZZ	AM IF with Ceramic Filter (455kHz)	AG
T203	RCILI0216AFZZ	AM IF	AD
T901	RTRNP0507AFZZ	Power	AY
		FILTERS	
CF101, CF102, CF103, CF104	RFILF0059AFZZ	FM IF, Ceramic [4 ceramic filters to be used in a set as a pair should be of the same type (the same color)].	AG AG AG AG
FL301, FL302	RFILL0050AFZZ	Low-Pass Filter (19kHz and 38kHz)	AK AK
		CONTROLS	
VR141	RVR-M0142AFZZ	2.2K (B) ohm, Signal Meter Level Adjust	AD
VR142	RVR-M0122AFZZ	500 (B) ohm, FM Muting Level Adjust	AC
VR301	RVR-B0052AGZZ	10K (B) ohm, V.C.O. Frequency Adjust	AE
VR302	RVR-M0132AFZZ	200K (B) ohm, FM Stereo Separation Adjust (Wide Position)	AC
VR303	RVR-M0135AFZZ	1 Meg (B) ohm, FM Stereo Separation Adjust (Normal Position)	AC
VR401	RVR-A0119AFZZ	20K (A) ohm, Output Level Control Volume	AK
VR501	RVR-M0084AGZZ	100K (B) ohm, FM Tuning Auto-Lock Level Adjust	AG
VR701	RVR-A0123AFZZ	50K (A) ohm, Air Check Level Control Volume	AE
VR702	RVR-M0131AFZZ	100K (B) ohm, Air Check Level Adjust	AC
VR901	RVR-M0127AFZZ	10K (B) ohm, Air Check Meter Adjust	AC
		ELECTROLYTIC CAPACITORS	
C101	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C111	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C112	VCEAAU1EW335A	3.3MFD, 25V, +75 −10%	AB
C117	VCEAAU1CW106Y	10MFD, 16V, +50 −10%	AB
C145	VCEAAU1CW476Y	47MFD, 16V, +50 −10%	AC
C159	VCEAAU1EW335A	3.3MFD, 25V, +75 −10%	AB
C162	VCEAAU1CW107Y	100MFD, 16V, +50 −10%	AC
C164	VCEAAU1CW476Y	47MFD, 16V, +50 −10%	AC
C166	VCEALU1HW334M	.33MFD, 50V, ±20%, Yellow	AB
C168	VCEAAU1CW106Y	10MFD, 16V, +50 −10%	AB
C169	VCEAAU1EW475A	4.7MFD, 25V, +75 −10%	AB
C171	VCEALU1HW334M	.33MFD, 50V, ±20%, Yellow	AB
C173	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C207	VCEAAU1CW106Y	10MFD, 16V, +50 −10%	AB
C213	VCEAAU1EW475A	4.7MFD, 25V, +75 −10%	AB
C214	VCEAAU1EW335A	3.3MFD, 25V, +75 −10%	AB
C216	VCEALU1HW104M	.1MFD, 50V, ±20%, Yellow	AB
C217	VCEAAU1CW107Y	100MFD, 16V, +50 −10%	AC
C301	VCEAAU1CW106Y	10MFD, 16V, +50 −10%	AB
C304	VCAAAU1AB335M	3.3MFD, 10V, ±20%, Aluminium	AD
C305	VCAAAU1EB155K	1.5MFD, 25V, ±10%, Aluminium	AC
C306	VCAAAU1EB474K	.47MFD, 25V, ±10%, Aluminium	AC
C307	VCEAAU1CW336Y	33MFD, 16V, +50 −10%	AC
C308	VCEAAU1CW336Y	33MFD, 16V, +50 −10%	AC
C311	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C312	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C314	VCEAAU1CW477Y	470MFD, 16V, +50 −10%	AD
C401	VCEALU1HW104M	.1MFD, 50V, ±20%, Yellow	AB
C402	VCEALU1HW104M	.1MFD, 50V, ±20%, Yellow	AB
C403	VCEAAU1AW476Y	47MFD, 10V, +50 −10%	AB
C404	VCEAAU1EW475A	4.7MFD, 25V, +75 −10%	AB
C405	VCEAAU1EW475A	4.7MFD, 25V, +75 −10%	AB
C501	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C503	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C504	VCEAAU1CW106Y	10MFD, 16V, +50 −10%	AB
C505	VCEAAU1CW336Y	33MFD,16V, +50 −10%	AC
C506	VCEAAU1EW475A	4.7MFD, 25V, +75 −10%	AB
C507	VCEAAU1CW106Y	10MFD, 16V, +50 −10%	AB
C508	VCEAAU1CW336Y	33MFD, 16V, +50 −10%	AC
C509	VCEALU1HW224M	.22MFD, 50V, ±20%, Yellow	AB
C510	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C601	VCEAAU1EW475A	4.7MFD, 25V, +75 −10%	AB
C602	VCEAAU1EW475A	4.7MFD, 25V, +75 −10%	AB
C603	VCEAAU1AW476Y	47MFD, 10V, +50 −10%	AB
C604	VCEAAU1EW475A	4.7MFD, 25V, +75 −10%	AB
C605	VCEAAU1CW106Y	10MFD, 16V, +50 −10%	AB
C606	VCEAAU1CW106Y	10MFD, 16V, +50 −10%	AB
C607	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C701	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C702	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C703	VCEAAU1HW105A	1MFD, 50V, +75 −10%	AB
C704	VCEALU1HW334M	.33MFD, 50V, ±20%, Yellow	AB
C705	VCEAAU1CW106Y	10MFD, 16V, +50 −10%	AB
C710	VCEAAU1CW336Y	33MFD, 16V, +50 −10%	AC
C711	VCEAAU1CW106Y	10MFD, 16V, +50 −10%	AB
C803	VCEAAU1EW228Y	2200MFD, 25V, +50 −10%	AH
C804	VCEAAU1EW227Y	220MFD, 25V, +50 −10%	AC
C805	VCEAAU1CW476Y	47MFD, 16V, +50 −10%	AC
C806	VCEAAU1EW227Y	220MFD, 25V, +50 −10%	AC
C807	VCEAAU1EW477Y	470MFD, 25V, +50 −10%	AD
C808	VCEAAU1CW476Y	47MFD, 16V, +50 −10%	AC
C904	VCEAAU1AW227Y	220MFD, 10V, +50 −10%	AC

PARTS LIST

CAPACITORS

(Unless otherwise specified capacitors are 50V, +80 −20%, Ceramic Type).

REF. NO.	PART NO.	DESCRIPTION	CODE
C102	VCKZPU1HB102K	.001MFD, 50V, ±10%, Ceramic	
C103	VCKZPU1HF203Z	.02MFD	
C104	VCKZPU1HF103P	.01MFD, 50V, +100 −0%, Ceramic	
C105	VCKZPU1HF103P	.01MFD, 50V, +100 −0%, Ceramic	
C106	VCKZPU1HF103P	.01MFD, 50V, +100 −0%, Ceramic	
C107	VCKZPU1HF103P	.01MFD, 50V, +100 −0%, Ceramic	
C108	VCKZPU1HF203Z	.02MFD	
C109	VCKZPU1HB102K	.001MFD, 50V, ±10%, Ceramic	
C110	VCKZPU1HF403Z	.04MFD	
C113	VCKZPU1HF103P	.01MFD, 50V, +100 −0%, Ceramic	
C114	VCKZPU1HF103P	.01MFD, 50V, +100 −0%, Ceramic	
C115	VCQYKU1HM472J	.0047MFD, 50V, ±5%, Mylar	AC
C118	VCKZPU1HF403Z	.04MFD	
C119	VCCSPU1HL181K	180PF, 50V, ±10%, Ceramic	
C141	VCKZPU1HB102K	.001MFD, 50V, ±10%, Ceramic	
C142	VCCSPU1HL270K	27PF, 50V, ±10%, Ceramic	
C143	VCKZPU1HF403Z	.04MFD	
C144	VCKZPU1HF203Z	.02MFD	
C146	VCKZPU1HF203Z	.02MFD	
C147	VCKZPU1HF203Z	.02MFD	
C148	VCCSPU1HL8R0D	8PF, 50V, ±0.5PF, Ceramic	
C149	VCKZPU1HB102K	.001MFD, 50V, ±10%, Ceramic	
C150	VCKZPU1HF203Z	.02MFD	
C151	VCKZPU1HF203Z	.02MFD	
C152	VCKZPU1HF203Z	.02MFD	
C153	VCKZPU1HF203Z	.02MFD	
C154	VCKZPU1HF203Z	.02MFD	
C155	VCKZPU1HF403Z	.04MFD	
C156	VCKZPU1HF203Z	.02MFD	
C157	VCKZPU1HF203Z	.02MFD	
C158	VCKZPU1HF403Z	.04MFD	
C160	VCKZPU1HF403Z	.04MFD	
C161	VCKZPU1HF403Z	.04MFD	
C163	VCKZPU1HF403Z	.04MFD	
C165	VCKZPU1HF403Z	.04MFD	
C167	VCCSPU1HL331J	330PF, 50V, ±5%, Ceramic	
C170	VCKZPU1HF403Z	.04MFD	
C172	VCKZPU1HF103P	.01MFD, 50V, +100 −0%, Ceramic	
C174	VCKZPU1HF403Z	.04MFD	
C175	VCKZPU1HB102K	.001MFD, 50V, ±10%, Ceramic	
C176	VCKZPU1HF403Z	.04MFD	
C201	VCKZPU1HF203Z	.02MFD	
C202	VCKZPU1HF403Z	.04MFD	
C203	VCKZPU1HF103P	.01MFD, 50V, +100 −0%, Ceramic	
C204	VCKZPU1HF403Z	.04MFD	
C205	VCKZPU1HB102K	.001MFD, 50V, ±10%, Ceramic	
C206	VCKZPU1HF403Z	.04MFD	
C208	VCQSMT1HD331G	330PF, 50V, ±2%, Styrol	AD
C210	VCKZPU1HF103P	.01MFD, 50V, +100 −0%, Ceramic	
C211	VCKZPU1HF103P	.01MFD, 50V, +100 −0% Ceramic	
C212	VCKZPU1HB102K	.001MFD, 50V, ±10%, Ceramic	
C215	VCQYKU1HM822J	.0082MFD, 50V, ±5%, Mylar	AC
C219	VCCSPU1HL5R0C	5PF, 50V, ±0.25PF, Ceramic	
C302	VCQSMT1HS391J	390PF, 50V, ±5%, Styrol	AB
C303	VCQYKU1HM473K	.047MFD, 50V, ±10%, Mylar	AC
C309	VCQYKU1HM122J	.0012MFD, 50V, ±5%, Mylar	AB
C310	VCQYKU1HM122J	.0012MFD, 50V, ±5%, Mylar	AB
C313	VCCSPU1HL680J	68PF, 50V, ±5%, Ceramic	
C502	VCKZPU1HF403Z	.04MFD	
C706, C707, C708, C709	VCQYKU1HM183J	.018MFD, 50V, ±5%, Mylar	AC
C801	VCKZPU1HF203Z	.02MFD	
C802	VCKZPU1HF203Z	.02MFD	
C809	VCKZPU1HF403Z	.04MFD	
C901	RC-PZ062CAFZZ	.033MFD, 450VAC, Oil	AG
C902	VCQYKU1HM332J	.0033MFD, 50V, ±5%, Mylar	
C906	VCKZPU1HF403Z	.04MFD	
C907	VCKZPU1HF403Z	.04MFD	

RESISTORS

(Unless otherwise specified resistors are 1/4W, ±5%, Carbon type).

REF. NO.	PART NO.	DESCRIPTION
R101	VRD-ST2EE104J	100K ohm
R102	VRD-ST2EE473J	47K ohm
R103	VRD-ST2EE473J	47K ohm
R104	VRD-ST2EE683J	68K ohm
R105	VRD-ST2EE155J	1.5 Meg ohm
R106	VRD-ST2EE223J	22K ohm
R107	VRD-ST2EE682J	6.8K ohm
R108	VRD-ST2EE102J	1K ohm
R109	VRD-ST2EE272J	2.7K ohm
R110	VRD-ST2EE124J	120K ohm
R111	VRD-ST2EE473J	47K ohm
R119	VRD-ST2EE473J	47K ohm
R120	VRD-ST2EE331J	330 ohm
R121	VRD-ST2EE154J	150K ohm
R122	VRD-ST2EE103J	10K ohm
R123	VRD-ST2EE104J	100K ohm
R124	VRD-ST2EE393J	39K ohm
R125	VRD-ST2EE223J	22K ohm
R126	VRD-ST2EE103J	10K ohm
R127	VRD-ST2EE273J	27K ohm
R128	VRD-ST2EE474J	470K ohm
R129	VRD-ST2EE224J	220K ohm
R130	VRD-ST2EE332J	3.3K ohm
R137	VRD-ST2EE682J	6.8K ohm
R138	VRD-ST2EE104J	100K ohm
R141	VRD-ST2EE101J	100 ohm
R142	VRD-ST2EE101J	100 ohm
R143	VRD-ST2EE473J	47K ohm
R144	VRD-ST2EE123J	12K ohm
R145	VRD-ST2EE102J	1K ohm
R146	VRD-ST2EE101J	100 ohm
R147	VRD-ST2EE100J	10 ohm
R148	VRD-SU2EY271J	270 ohm
R149	VRD-ST2EE392J	3.9K ohm
R150	VRD-ST2EE102J	1K ohm
R151	VRD-ST2EE103J	10K ohm
R152	VRD-ST2EE680J	68 ohm
R153	VRD-ST2EE102J	1K ohm
R154	VRD-ST2EE103J	10K ohm
R155	VRD-ST2EE331J	330 ohm

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
R156	VRD-ST2EE101J	100 ohm	
R157	VRD-ST2EE473J	47K ohm	
R158	VRD-ST2EE123J	12K ohm	
R159	VRD-ST2EE101J	100 ohm	
R160	VRD-ST2EE271J	270 ohm	
R161	VRD-ST2EE100J	10 ohm	
R162	VRD-ST2EE102J	1K ohm	
R163	VRD-ST2EE390J	39 ohm	
R164	VRD-ST2EE333J	33K ohm	
R165	VRD-ST2EE103J	10K ohm	
R166	VRD-ST2EE223J	22K ohm	
R167	VRD-ST2EE822J	8.2K ohm	
R168	VRD-ST2EE223J	22K ohm	
R169	VRD-ST2EE102J	1K ohm	
R170	VRD-ST2EE101J	100 ohm	
R171	VRD-ST2EE271J	270 ohm	
R172	VRD-ST2EE560J	56 ohm	
R173	VRD-ST2EE331J	330 ohm	
R174	VRD-ST2EE102J	1K ohm	
R175	VRD-ST2EE331J	330 ohm	
R177	VRD-ST2EE182J	1.8K ohm	
R178	VRD-ST2EE183J	18K ohm	
R179	VRD-ST2EE682J	6.8K ohm	
R180	VRD-ST2EE271J	270 ohm	
R181	VRD-ST2EE103J	10K ohm	
R182	VRD-ST2EE103J	10K ohm	
R183	VRD-ST2EE273J	27K ohm	
R185	VRD-ST2EE123J	12K ohm	
R186	VRD-ST2EE562J	5.6K ohm	
R187	VRD-ST2EE333J	33K ohm	
R188	VRD-ST2EE273J	27K ohm	
R189	VRD-ST2EE333J	33K ohm	
R190	VRD-ST2EE224J	220K ohm	
R191	VRD-SU2EY393J	39K ohm	
R201	VRD-ST2EE683J	68K ohm	
R202	VRD-ST2EE152J	1.5K ohm	
R203	VRD-ST2EE682J	6.8K ohm	
R204	VRD-ST2EE471J	470 ohm	
R205	VRD-ST2EE331J	330 ohm	
R206	VRD-ST2EE151J	150 ohm	
R207, R208, R209	VRD-ST2EE103J	10K ohm	
R210	VRD-ST2EE153J	15K ohm	
R211	VRD-ST2EE680J	68 ohm	
R212	VRD-ST2EE152J	1.5K ohm	
R301	VRD-ST2EE473J	47K ohm	
R302	VRD-ST2EE104J	100K ohm	
R303	VRD-ST2EE183J	18K ohm	
R304	VRD-ST2EE104J	100K ohm	
R306	VRD-ST2EE102J	1K ohm	
R307, R308	VRD-ST2EE682J	6.8K ohm	
R309	VRD-ST2EE333J	33K ohm	
R310	VRD-ST2EE473J	47K ohm	
R311, R312	VRD-ST2EE472J	4.7K ohm	
R313	VRD-ST2EE473J	47K ohm	
R314	VRD-ST2EE333J	33K ohm	
R315, R316	VRD-ST2EE223J	22K ohm	
R317	VRD-ST2EE101J	100 ohm	
R318, R319	VRD-ST2EE472J	4.7K ohm	
R320	VRD-ST2EE223J	22K ohm	

REF. NO.	PART NO.	DESCRIPTION	CODE
R321	VRD-ST2EE223J	22K ohm	
R322, R323	VRD-ST2EE822J	8.2K ohm	
R401, R402, R403	VRD-ST2EE224J	220K ohm	
R404	VRD-ST2EE273J	27K ohm	
R405, R406	VRD-ST2EE821J	820 ohm	
R407, R408	VRD-ST2EE273J	27K ohm	
R409, R410	VRD-ST2EE472J	4.7K ohm	
R411, R412	VRD-ST2EE822J	8.2K ohm	
R413, R414	VRD-ST2EE153J	15K ohm	
R415, R416	VRD-ST2EE221J	220 ohm	
R500	VRD-ST2EE154J	150K ohm	
R501	VRD-ST2EE335J	3.3 Meg ohm	
R502	VRD-ST2EE224J	220K ohm	
R503	VRD-ST2EE224J	220K ohm	
R504	VRD-ST2EE103J	10K ohm	
R505	VRD-ST2EE684J	680K ohm	
R506	VRD-ST2EE104J	100K ohm	
R507	VRD-ST2EE104J	100K ohm	
R508	VRD-ST2EE272J	2.7K ohm	
R509	VRD-ST2EE823J	82K ohm	
R510	VRD-ST2EE334J	330K ohm	
R511	VRD-ST2EE563J	56K ohm	
R512	VRD-ST2EE102J	1K ohm	
R513	VRD-ST2EE103J	10K ohm	
R514	VRD-ST2EE273J	27K ohm	
R515	VRD-ST2EE333J	33K ohm	
R516	VRD-ST2EE823J	82K ohm	
R517	VRD-ST2EE272J	2.7K ohm	
R518	VRD-ST2EE102J	1K ohm	
R520	VRD-ST2EE104J	100K ohm	
R523	VRD-ST2EE122J	1.2K ohm	
R524	VRD-ST2EE103J	10K ohm	
R525	VRD-ST2EE154J	150K ohm	
R526	VRD-ST2EE152J	1.5K ohm	
R527	VRD-ST2EE102J	1K ohm	
R528	VRD-ST2EE272J	2.7K ohm	
R529	VRD-ST2EE823J	82K ohm	
R601	VRD-ST2EE223J	22K ohm	
R602	VRD-ST2EE563J	56K ohm	
R603	VRD-ST2EE332J	3.3K ohm	
R604	VRD-ST2EE184J	180K ohm	
R605	VRD-ST2EE101J	100 ohm	
R606	VRD-ST2EE124J	120K ohm	
R607	VRD-ST2EE682J	6.8K ohm	
R608	VRD-ST2EE154J	150K ohm	
R609, R610	VRD-ST2EE152J	1.5K ohm	
R611	VRD-ST2EE223J	22K ohm	
R612	VRD-ST2EE104J	100K ohm	
R701	VRD-ST2EE152J	1.5K ohm	
R702	VRD-ST2EE105J	1 Meg ohm	
R703	VRD-ST2EE682J	6.8K ohm	
R704	VRD-ST2EE472J	4.7K ohm	
R705	VRD-ST2EE392J	3.9K ohm	
R706	VRD-ST2EE102J	1K ohm	
R707	VRD-ST2EE181J	180 ohm	

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
R708	VRD-ST2EE103J	10K ohm	
R709	VRD-ST2EE823J	82K ohm	
R710	VRD-ST2EE823J	82K ohm	
R711, R712	VRD-ST2EE153J	15K ohm	
R713	VRD-ST2EE223J	22K ohm	
R714	VRD-ST2EE181J	180 ohm	
R715	VRD-ST2EE332J	3.3K ohm	
R716	VRD-ST2EE153J	15K ohm	
R717	VRD-ST2EE103J	10K ohm	
R718	VRD-ST2EE334J	330K ohm	
R801	VRD-ST2EE331J	330 ohm	
R802	VRC-MT2HG150K	15 ohm, 1/2W, ±10%, Solid	
R803	VRD-ST2EE331J	330 ohm	
R804	VRD-ST2EE331J	330 ohm	
R900	VRD-ST2EE472J	4.7K ohm	
R901	VRD-ST2EE152J	1.5K ohm	
R902	VRD-ST2EE222J	2.2K ohm	
R903	VRD-ST2EE471J	470 ohm	
R904	VRD-ST2EE104J	100K ohm	
R905	VRD-ST2EE563J	56K ohm	
R906, R907	VRD-ST2EE104J	100K ohm	
R908	VRD-ST2EE182J	1.8K ohm	
R909	VRD-ST2EE562J	5.6K ohm	
R910	VRD-ST2EE332J	3.3K ohm	

MISCELLANEOUS

CPNLC3282AF01	Panel Assembly (ST-3636H)	–
CPNLC3282AF02	Panel Assembly (ST-3636HB)	–
CSPRT0304AF18	Dial Cord Assembly	–
GCAB-3040AFSA	Cabinet	BA
GCOVA1070AFSC	Guide (Large), Lever Switch (ST-3636H)	AD
GCOVA1097AFSA	Guide (Large), Lever Switch (ST-3636HB)	AD
GCOVA1071AFSC	Guide (Small), Lever Switch (ST-3636H)	AD
GCOVA1098AFSA	Guide (Small), Lever Switch (ST-3636HB)	AD
GFTAU3056AFZZ	Plate, Bottom	AN
GLEGP0002SG00	Leg	AD
HDALM0178AFSA	Dial Scale	AU
HDECB0062AFSA	Decoration Plate, Dial Scale, Side	AC
HDECB0063AFSA	Decoration Plate, Dial Scale, Under	AL
HDECZ0052AFSA	Window, Transparent	AU
HPNLC3282AFSA	Panel (ST-3636H)	BE
HPNLC3282AFSB	Panel (ST-3636HB)	
HSSND0227AFSA	Dial Pointer	AF
JKNBB0060AFSA	Knob, Tuning Control (ST-3636H)	
JKNBB0060AFSB	Knob, Tuning Control (ST-3636HB)	
JKNBN0227AFSA	Knob, Air Check Level Control	AC
JKNBN0330AFSA	Knob, Output Level Control, Band Selector/High-Blend (ST-3636H)	AH
JKNBN0330AFSB	Knob, Output Level Control, Band Selector/High-Blend (ST-3636HB)	AH
JKNBP0070AFSA	Knob, Power Switch, Multipath/IF Band Switch, Air Check/FM Muting Switch (ST-3636H)	AH
JKNBP0070AFSC	Knob, Power Switch, Multipath/IF Band Switch, Air Check/FM Muting Switch (ST-3636HB)	AH
LANGF0377AFZZ	Bracket, Lamp P.W. Board	AF
LANGF0378AFZZ	Bracket, Meter Illumination	AC
LANGK0188AFZZ	Bracket, Transformer T103	AA
LANGQ0423AFZZ	Bracket, AM Bar Antenna	AB
LANGQ0510AFZZ	Bracket, Voltage Selector Socket	AB
LANGQ0516AFSA	Rear Panel (ST-3636H)	AS
LANGQ0541AFSA	Rear Panel (ST-3636HB)	
LANGR0369AFZZ	Bracket, Air Check Level Volume	AB
LANGR0410AFZZ	Bracket, Output Level Control Volume	AB
LANGR0415AFZZ	Bracket, Tuner (FM Front-end)	
LANGR0419AFZZ	Bracket, Front Panel	
LANGT0451AFZZ	Bracket, Sides	AE
LANGT0501AFZZ	Bracket, Main P.W. Board	AE
LANGT0590AFZZ	Bracket, Pulley (Refer to Fig. 3)	AB
LANGT0619AFZZ	Bracket, Pulley (Refer to Fig. 3)	AB
LBSHC0004AGZZ	Bushing, Power Supply Cord (Refer to Fig. 48)	AC
LBSHC0007AFZZ	Bushing, Power Supply Cord (Refer to Fig. 48)	AB
LBSHC0053AFZZ	Bushing, AM Bar Antenna Lead Wire	AB
LBSHZ0001AF00	Bushing, Lamp	AA
LHLDF1204AFZZ	(Refer to Fig. 49)	AB
LHLDW1052AFZZ	Wire Clip (Refer to Fig. 49)	AA
LHLDW1057AFZZ	Wire Clip (Refer to Fig. 49)	AA
LX-HZ0053AFFD	Flange Head Screw	AA
LX-WZ5065AGFE	Shakeproof Lockwasher Internal Type, Fuse Holder	AB
LX-LZ0051AF00	Rivet, Special (Refer to Fig. 49)	
LX-LZ0054AF00	Rivet, Special (Refer to Fig. 49)	
MSPRK0052AFZZ	Plate Spring, Front Panel Bracket	AB
MSPRT0304AFFJ	Spring, Dial Cord	AA
NDRM-0150AFZZ	Drum, Dial Cord	AF
NPLYB0001SGZZ	Pulley, Dial Cord	AB
NPLYC0101AFFD	Pulley Shaft	AA
NSFTD0174AFZZ	Tuning Shaft with Flywheel	AP
PCOVZ8052AFZZ	Cover, Meter Illumination Lamp, Green	AA
PREFL0060AFZZ	Acryl Plate, Meter Illumination	
PSHEF0110AFZZ	Sheet, Lever Switch	AA
PREFL0059AFZZ	Acryl Plate, Dial Illumination, Transparent	
PSLDM3135AFZZ	Shield Plate, Transformer T103	
PSPAI0113AFZZ	Spacer, Lamp P.W. Board, Fiber	AC
PSPAI0119AFZZ	Spacer, U.K. Standard Co-axial Antenna Socket, Fiber	AA
PSPAN0004AF09	Spacer, Tuning Shaft	AB
PSPAZ0060AFZZ	Spacer, LED	AA
PSPO-0058AFZZ	Sponge, Dial Illumination Acryl Plate	AC
QACCB0052AF09	Power Supply Cord	AM
QACCL0001AFZZ	Power Supply Cord	AR
QACCV0001AGZZ	Power Supply Cord with Plug	AP
QACCZ0002AG08	Power Supply Cord	AF
QPLGA0201AGZZ	Plug, Power Supply Cord	AE

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
	QACCZ0002TA0F	Power Supply Cord with Plug (USA type Plug)	AF
	QANTW0055AFZZ	FM Indoor Antenna, T-Shape	AH
	QCNW-0127AFZZ	Connecting Cord, RCA Type	AM
F901	QFS-C101CAGNI	Fuse, 100mAT	AF
F901	QFS-C201CAGNI	Fuse, 200mAT	AE
	QPWBF0579AFZZ	Printed Wiring Board, Lamp	
	QPWBF0630AFZZ	Printed Wiring Board, Main	
	QPWBF0631AFZZ	Printed Wiring Board, Touch Senser	
	QFSHD1001SEZZ	Lamp Holder	AA
	QFSHP1001AGZZ	Fuse Holder, F901	AH
	QLUGL0250AFZZ	Terminal Strip, 2-Lug	AC
SO901	QSOCZ2177AFZZ	Socket, U.K. Standard Co-axial Antenna, 75 ohms (FM)	AF
SO902	QSOCE0410AGZZ	Socket, Voltage Selector	AH
SO903 (A ~ F)	QSOCJ2650AFZZ	Socket, Output [Multipath (SO903-A, B), Fixed (SO903-C, D), Variable (SO903-E, F)]	AH
SW901	QSW-R0145AFZZ	Switch, Band Selector (AM/FM Stereo/High Blend/FM Mono)	AQ
SW902	QSW-B0053AFZZ	Switch, Air Check/FM Muting	AL
SW903	QSW-B0053AFZZ	Switch, Multipath/IF Band	AL
SW904	QSW-B9073AFZZ	Switch, Power	AM
TB901	QTANN0453AFZZ	Antenna Terminals, FM (75 ohms and 300 ohms) and AM	AH
PL905, PL906	RLMPM0075AFZZ	Lamp, Meter Illumination	–
PL901, PL902, PL903, PL904	RLMPP0056AFZZ	Lamp, Dial Illumination	AF
ME901	RMTRL0129AFSA	Meter, FM Tuning	AV
ME902	RMTRL0137AFSA	Meter, Signal/Air Check	AU
	RTUNF0062AFZZ	Tuner (FM Front-end)	BQ
	SPAKA0447AFZZ	Packing Add., Right	AH
	SPAKA0456AFZZ	Packing Add., Left	AH
	SPAKC1000AFZZ	Packing Case (ST-3636H)	AQ
	SPAKC1052AFZZ	Packing Case (ST-3636HB)	
	SSAKA0023AGZZ	Polyethylene Bag, Set	AC
	TINSL0103AFZZ	Operation Manual	
	XBBSD40P45000	Screw, AM Bar Antenna	
	XNESD40-32000	Nut, AM Bar Antenna	

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